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ABSTRACT

As part of an effort to statistically validate the placement tests used in California's San Diego Community College District (SDCCD) a study was undertaken to review the criteria- and content-related validity of the Assessment and Placement Services (APS) reading and writing tests. Evidence of criteria and content validity was gathered from technical materials produced by the test publisher, which indicated that a wide range of test developers and evaluators have shown that the tests cover the desired domain of content and have produced reliable results, as well as local surveys of students and faculty conducted from 1991 to 1993. In addition, English course performance was analyzed for all students enrolling in fall 1994 who took the tests to determine correlations between test scores, student characteristics, and performance. This analysis found that the strongest predictors of English course performance were students' high school grade point average (GPA) and the combined APS reading and writing test score. Further, it was found that high school GPA was not highly correlated with test scores, while its inclusion with the scores in a predictor scale mitigated the effects of student ethnicity, gender, and age in explaining variance in students' final grades in English courses. As a result of the study, cut scores were developed for placement into college-level English. Data tables are appended. (HAA)

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ED 398 965

English Placement Testing, Multiple Measures, and Disproportionate Impact

An Analysis of the Criterion- and Content-Related Validity Evidence for the Reading & Writing Placement Tests in the San Diego Community College District

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JC 960 500

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English Placement Test Statistical Validation Report

This is one in a series of reports describing and documenting the statistical validation evidence compiled in support of the placement tests used by the San Diego Community College District to recommend placement levels for matriculating students in English and Mathematics courses. Other reports concerning the SDCCD placement tests published by the Research and Planning office include the potential disproportionate impact of the English placement tests (Skills Testing and Disproportionate Impact, 1992); in-class surveys regarding placement accuracy and fairness (Faculty and Student Evaluations of Placement Practices in the SDCCD, 1990); alternate evidence gathered via matriculation surveys conducted over the last several years (SDCCD Matriculation Services Survey Report; Mesa College Matriculation Survey Report; Miramar College Matriculation Program Survey Report;, Student Perceptions of the San Diego Community Colleges); factors predicting success in English and mathematics courses, (Validating Placement Tests in the SDCCD, The Role of Biographical, Educational and Grading Variation); and reliability evidence of the placement tests (Research Brief on the Reliability of the APS Placement Tests). This report summarizes the content-related validity evidence and criterion-related validity evidence obtained both from the test publisher and locally to determine the validity of the inferences made from these tests about student ability and performance.

Validity in Educational Measurement

Central to the process of test validation is an understanding of what is meant by the

phrase, "the validity of a test." The tests used in the SDCCD to place students in the English, math, or ESL curriculums are best viewed by all participants in the process as tools we use to make inferences about some ability or behavior. A noted psychometrician once observed that "one validates, not a test, but an interpretation of data arising from a specific procedure[1]." Thus the process of validation does not judge whether the test and the score it yields are valid, but rather the focus is on the *interpretation* of those test scores. Therefore the placement tests themselves are not validated, but instead we validate the inferences we draw based on the use of tests for placement in the curriculum. As stated by Popham:

> ...there is no a simple on/off determination of whether a score-based inference is valid. Rather, we must make judgements regarding the validity of score-based inferences. In order to make those judgements as defensibly as possible, we assemble one or more types of evidence of validity[2].

The concept of validity in educational measurement is concerned with validity of score based inferences. This is the operational definition of validity used in this study.

Content Related Validity

According to Popham, there are two basic strategies in assessing the content-related validity evidence of a test. One method attempts to incorporate suitable content on the test during the development of the instrument. Under this approach, the test developers use expert judgement and professional advice to attempt to construct a test that adequately represents a

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[1] Samuel A. Messick, "The Standard Problem: Meaning and Values in Measurement and Evaluation," American Psychologist, 30 (1975), 955-966

[2] James W. Popham, "Modern Educational Measurement: A Practitioner's Perspective . 2nd edition (1990): Angled Cliffs, NJ, Prentice Hall .

desired domain of content. For this study, evidence of this type was gathered from the technical manuals supplied with the APS tests that describe test development and technical data.

The second method in gathering content-related evidence of validity is to examine the test and judge the representativeness of its content. Evidence for this was gathered during the initial selection of the APS tests by the SDCCD English faculty for use in placement.

From the Publisher:

According to the Standards for Educational and Psychological Testing[3], validity evidence ..."demonstrates the degree to which the sample of items, tasks, or questions on a test are representative of some defined universe or domain of content." This is the operational definition used in this part of the study to assess the content-related validity of the English placement tests. The SDCCD reading and English placement system uses the Assessment and Placement Services for Community Colleges tests developed by the College Board under the auspices of the Educational Testing Service (ETS) of Princeton, New Jersey. These tests were drawn from the Comparative Guidance Program (CGP) which was a testing program developed in the late 1960's at ETS. The English, or Writing, portion of the test is the revised version of the CGP and the Reading placement test was introduced in 1984. The tests are hereafter referred to in this report as the APS Reading and Writing tests. There are instances at times in this report where the Writing test is also referred to as the English test.

Evidence of content related validity was gathered through review of the technical manuals and materials included with the test materials provided by the College Board. This

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3 Standards for Educational and Psychological Testing. Prepared by a joint committee of the American Psychological Association, the American Educational Research Association, and the National Council on Measurement in Education (Washington, D.C.; American Psychological Association, 1985).

evidence and descriptions of the test are described below.

The APS Reading Placement Test

The 25 minute APS Reading test contains 35 multiple choice questions based on eight reading passages. These selections, which are mostly written by contemporary writers use content drawn from the natural sciences, social sciences, and contemporary life. They vary in style and exemplify different types of writing: straightforward reporting, persuasive writing, and description. Questions are intended to measure the student's comprehension of main ideas and specific details and their ability to make inferences and extract the meaning of vocabulary in context.

The test developer states that the placement scores are meant to differentiate among students who are "adequately prepared for academic work in college and those who may need developmental work, and they are useful in placing students in appropriate English courses." (College Board 1985; p. 6) Specific abilities tested and the related questions are shown in table 1.

Table 1

Reading Abilities Assessed and Corresponding Test Items on APS Reading Placement Test

Specific Abilities in Reading	Test Questions Used
Understanding Main Idea	1, 8, 13, 21, 24, 25, 28, 30
Understanding Secondary Idea	3, 5, 6, 9, 16, 20, 23, 34
Ability to Make Inferences	12, 14, 16, 17, 22, 26, 29, 31, 33
Understanding Vocabulary in Context	2, 4, 7, 10, 11, 15, 27, 32, 35

Source: College Board, 1984

The APS Writing Placement Test

The writing placement test contains 40 multiple choice questions intended to measure a student's ability to perform the "kind of writing usually required of students in colleges." (College Board, 1984, p 6). The test questions assess ability to recognize errors in grammar, usage, word choice, etc. The test appears to place emphasis on sentence structure, and clear expression in ideas and thoughts. There is no writing sample included in this assessment, the test relies solely on responses to a series of four part multiple-choice items.

According to the College Board, a student scoring high on this placement test has a high probability of being able to write correctly and effectively. They cite prior research (Godshalk, 1966) which indicated that scores on multiple choice questions similar to those used in the writing test are highly correlated to scores received by students on essay tests based on inter-rater reliability. The specific writing competencies assessed and relevant test items are shown in table 2.

Table 2

Writing Abilities Assessed and Corresponding Test Items on APS Writing Placement Test

Specific Abilities in Writing	Test Questions Used
Sentence Recognition	1, 18, 22, 37
Sentence Structure	4, 25, 28, 34, 35, 36
Pronoun Problems	3, 7, 20, 29, 33, 40
Language and Style	2, 5, 13, 15, 23
Verb Problems	8, 17

Logic	10, 12, 16, 21, 24, 27, 31, 32, 39
Recognition of error-free construction	6, 9, 11, 14, 19, 26, 30, 38

Source: College Board, 1984

Scores and Technical Data

According to the publisher, the tests were scaled such that the score range extended from 20 to 80 using standard scores, with an average of 50 and a standard deviation of 10. Thus the tests were originally scaled such that approximately two-thirds of the original norming group should have scores between 40 and 60.

The placement test scores are intended to provide information to predict performance in college level courses in writing and reading, but do not provide diagnostic information. A longer test involving repeated samplings of a specific knowledge domain or competency would be required to make diagnostic referrals. As they are currently implemented, the placement tests are used solely for recommended referral to levels of English ranging from pre-collegiate to college level. Performance on groups of questions or competency clusters is not reported by the publisher. In reviewing the technical manual supplied with the placement tests it was noted that the test publisher recommends the use of standard scores, however the SDCCD does not use the standard scores but rather relies on raw scores. This was noted in an earlier report on Disproportionate Impact and that time the report recommended that the SDCCD convert the raw scores to standard score recommended by the test publisher. However the test score data analyzed for this report and to gather the reliability evidence still show the use of raw scores to make referrals.

In the view of the English faculty and other faculty reviewing tests for use by the SDCCD

for placement into the English curriculum, the content of the APS tests was found to be the most closely aligned with the skill areas emphasized in the English department developmental and college level courses. Also the APS Placement tests have been approved for use in the California Community Colleges for placement by the State Chancellor's Office of the California Community Colleges.

Criterion-Related Validity Evidence

From the publisher:

The technical manual and the APS tests themselves provide some evidence as to the content- and criterion-related validity of the APS placement tests. According to the technical manual supplied by the College Board to support the APS tests[1], English faculty helped in "developing the tests and establishing their content validity" (p. 21). This assistance took the form of identifying the skills they thought necessary for success in English courses as taught in open-admission, post-secondary institutions. These instructors also approved all items used in the tests. The technical manual also provided information on the items used to address the content domain in community college English courses.

The College Board sponsored validity studies that are summarized in the technical manual. These data are summarized in table 3 below. The validity studies they conducted relied primarily on correlations between test scores achieved by examinees prior to beginning college

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[1] The College Board: The Assessment and Placement Services for Community Colleges Technical Manual. Princeton, NJ: Educational Testing Service.

coursework and grades earned at the end of the first or second semester. Correlations were obtained from 64 validity studies, each of which had at least 100 students. The criterion variable was the final grade earned in the English course.

Table 3

Correlations of Test Scores and Grades in English Courses as Reported by the College Board

Course	Predictor	Median	Highest	Lowest
English	Reading	.28	.51	-.01
	Writing	.32	.55	.03
	Reading and Writing	.35	.57	.04

Although the correlations submitted by the College Board appear to have a moderate relation to the criterion variable, there are critical questions that were not addressed in the summary presented in the technical manual. For example, correlations between final grade and test by course level (pre-collegiate and college) were not given. Also, were students who dropped or withdrew late in the course included in the study? Did they treat withdrawals as failures and assign them a value of "zero" for analysis purposes or were these students not included in the study? Were students taking the class for Credit/Non Credit included? If so, what value was assigned a credit grade? A non credit grade? Another problem not discussed in the Incomplete grade notation. Did the INC notation also count as a failure or did the researchers

drop these students from the study? The problem of what has come to be called the "troublesome W" in validation studies conducted by research offices in the two year colleges is not addressed in the APS study. For example, the high proportion of W notations (approximately 16-18%, depending on the terms analyzed) appearing in the student transcripts for English and mathematics courses here in the SDCCD is a potentially confounding factor in interpreting the correlation between final grade and placement test score. The W grade is troublesome because of the uncertainty about what it represents. In some instances, the W could be considered a non-successful grade if students who are performing below a certain level withdraw from the course to avoid a low grade. On the other hand, a student may be doing well in a course and drop late in the term for reasons unrelated to academic ability or commitment to college attendance. These unanswered questions regarding the study design and methodology make it difficult to compare these findings with local validation studies using similar criterion-related validity evidence.

For the purposes of this study two dependent variables are used most often, one including, and the other excluding the troublesome W. In several of the tables and regression models presented in this report, the W grade has been included in a variable called Modified GPA (MODGPA). This definition codes an A grade as equal to four points, a B grade as equal to three points, a C grade as equal to two points, and D, F, W, INC, as equal to one point. Traditional GPA as a dependent variable is also used in several of the tables and analyses for this validation study. In cases where it was important to maintain adequate sample sizes, and for informational purposes, the modified GPA was included in the analyses. This was done both to analyze the extent to which the W is a measure of academic performance, and to provide the college academic leadership with information on the proportion of W grade notations given

during the term.

Local Studies

The relationship between APS Reading and Writing placement scores and course performance has been studied locally. This is the third report that includes an examination of the relationship between APS Placement tests and course grades in English. The first report used an in-class survey to ask students if they were placed accurately, that is, did they have sufficient skills to achieve at least a 'C' grade in the course? In this same study, faculty were also asked to indicate the proportion of students placed in their class who belonged in a higher level course, a lower level course, or were placed accurately. This study found that overall, both students and faculty felt that the APS Placement tests resulted in a high degree of placement accuracy[2]. The second study which included an examination of the relationship between APS Placement scores and course performance examined several factors that predicted final course grade in English and mathematics courses in the SDCCD[3]. This report showed local statistical criterion related evidence of the APS Placement tests through the use of correlational methods and regression, and also identified several other important variables that predict final grade, among them

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[2] Student and Faculty Evaluation of Placement Results: Results of In-Class Surveys of Faculty and Students Regarding SDCCD Placement Practices and Results. SDCCD Research and Planning, Spring, 1991

[3] Matriculation Report: Validating Placement Tests in the San Diego Community College District: The Relationship of Placement Test Scores, Biographical Data, and Grading Practices to Course Success, SDCCD Research and Planning, 1994

instructor grading variation.

Additional alternative evidence addressing fairness, accuracy, and general satisfaction with assessment and placement in the SDCCD has been gathered using survey data. For example, the Matriculation Services Satisfaction Survey conducted in 1992 asked students to rate their satisfaction with English and mathematics assessment. Although the results varied slightly by college, overall approximately 75% rated the assessment process as "Excellent or Good." These results were not found to differ appreciably by ethnic, racial, or gender grouping. [4] Another survey conducted districtwide in the spring, 1993 term found similar results. Of the students surveyed who recognized and used assessment and placement services, almost 80% were satisfied with these services.[5] As with the survey conducted prior to the 1993 survey, there were not large differences between racial, ethnic, and gender groupings in response to this question of satisfaction with assessment and placement.

Specific college surveys conducted by the Research department have tended to confirm the evidence of the fairness of assessment and placement districtwide. For example, a study conducted by the SDCCD Research Office for the Mesa College Matriculation office found that a clear majority of students who took the placement tests in English and mathematics agreed that they were placed in the correct level of English (81%) and mathematics course (76%). A similar proportion (82.2%) also agreed that they understood the explanation they received about the

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[4] Matriculation in the SDCCD: Equity and Student Satisfaction with Matriculation Services, SDCCD Research and Planning, 1993

[5] Survey '93: Student Perceptions of SDCCD Educational Services, SDCCD Research and Planning, July, 1993

results of the assessment and placement tests. Further, students who indicated that they understood the explanation of their assessment results were significantly more likely than students who did not to say that they were enrolled in the correct level of English (87% compared with 59%). A similar finding obtained for mathematics course placement. This is evidence that counseling, where possible, is performing an essential service in the clear explanation of the meaning of placement test results[6]. This is a positive indication of the success of integrating assessment results with student consultations. Students who have been explained the context, meaning, and purpose of assessment and placement as part of an overall educational planning process are far more satisfied with English and mathematics assessment.

Evidence as to the accuracy, fairness, and satisfaction with the assessment process was also gathered using a Matriculation Services Survey at Miramar College[7]. Students were asked to respond to a series of statements regarding various Matriculation services at the college using a Likert type scale. Several statements focused specifically on the assessment and placement component. Student responses suggested a high degree of satisfaction with the assessment process for accuracy and fairness. For example, statement #9 on the survey, "My test scores helped me to enroll in the right level of English class," elicited a clear majority of affirmative responses. Almost 90% either agreed strongly, or agreed with this statement. No significant differences from this pattern were noted among gender or ethnic groups. Older students (21-30)

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[6]Student Satisfaction with Matriculation Services: San Diego Mesa College, SDCCD Research and Planning, July, 1993.

[7]Student Satisfaction with Matriculation Services: San Diego Miramar College, SDCCD Research and Planning, July, 1993.

tended to agree with this statement (89%) more than younger (17-21) students (84%). Similar results were found for the statement regarding the role of test scores in enabling students to enroll in the right level of mathematics course. A clear majority (78%) either agreed or strongly agreed that assessment test scores in math helped them enroll in the right level of math class. Slight differences were found in the pattern of responses between men and women with men showing higher levels of agreement (80%) than women (75%). The view that assessment test scores helped them enroll in the right level of math class was expressed at higher rates by students between the ages of 21-30 years (82%) than by those aged 17-20 years (68%). The analysis found that responses to this question by race and ethnicity did not differ in a practical sense from the general pattern. As was the case with the Mesa college respondents, understanding the results of placement testing was found to be an important moderating variable on the perception of the fairness and accuracy of testing.

Criterion-Related Validity Evidence: The Current Study

In addition to the evidence described above, the statistical relationship between the APS Reading and Writing Placement test scores and course performance was also studied locally using methodology recommended by the State Chancellor's Office of the California Community Colleges in the Matriculation Local Research Options handbook. Both tests were shown to be significantly correlated with English course performance at the SDCCD colleges. In addition, regression analysis identified several variables which serve as additional predictors of performance. The following section describes these results.

Sample. The students included in the primary analyses for this study were all students enrolling in the SDCCD who were assessed during the fall, 1994 testing period and subsequently

enrolled directly in an English course and received a grade notation on their transcripts. Student records were matched using the computerized assessment and placement system used in the testing centers and the Research and Planning student extract files which contain demographic data, courses taken, and final grade received. More than four thousand cases were available for analyses. Depending on the criterion variable and level of course analyzed, the number of cases in particular analyses presented in this report does vary, but remains sufficiently high to maintain reliability. Descriptive statistics for the sample are included in the appendix to this report.

Descriptive Statistics and Correlation Analysis. The correlation between the APS Reading, APS Writing, and the combined APS Reading and English Placement test scores and grades in all English courses during the fall, 1994 term are presented in table 4 below.

Table 4
Descriptive Statistics for Reading, Writing, and Grades in all English Courses in the SDCCD Fall, 1994

Variable	Cases	Mean Score	Std Dev
Reading Test	4322	17.8	7.3
Writing Test	4322	22.0	7.0
Combined Reading and Writing Tests	4321	39.9	13.3
MODGPA	3834	2.1	1.0
GPA	3022	2.4	1.1

The correlations of reading and writing placement test scores with the dependent

variables (both traditional GPA and modified GPA) are given below in table 5.

Table 5
Correlation of APS Reading and Writing Tests with Outcome Measures For All Levels of English

Criterion	APS Reading	APS Writing	Combined
GPA*	.1993	.2384	.2360
(N)	(2503)	(2504)	(2503)
Probability	P= .000	P= .000	P= .000
MODGPA**	.1462	.1953	.1835
(N)	(3227)	(3228)	(3227)
Probability	P= .000	P= .000	P= .000

Note: 1-tailed Significance Levels are shown. *GPA is a five point scale with A=4, B=3, C=2, D=1, F=0 all other notations are deleted from the analysis. ** MODGPA is a five point scale similar to GPA but includes D, F, W, NC as a score of 1.

The correlation between the combined APS Reading and English Placement test scores and course performance in English 101 was .24 for GPA based on a five point scale (A=4, B=3, C=2, D=1, F=0), and .22 using a criterion variable called Modified GPA. This dependent variables codes final grade notations as A=4, B=3. C=2, D, F, W, NC=1. For the APS Reading test, the correlation with final grade (GPA) was .18 and for APS Writing, the coefficient was .25. A similar set of coefficients was found when examined for English 101 courses only as shown in table 5 below. In each case the relationship between final grade and the test scores are statistically significant although writing demonstrates a consistently stronger relationship with

the dependent variables than does the reading test.

It has been noted by other analysts conducting validation studies including the state chancellor's office that moderate or low correlation coefficients does not necessarily mean the measures used to predict performance are not related to the dependent variable of final grade. Review of test validation literature and prior analyses by the institutional research office suggested several technical constraints that may serve to weaken or lower the observed correlations. These include:

1. Restriction of range in the criterion variable of final grade,
2. Restriction of range on the predictor due to use of an existing cut score to place students, and,
3. The instability of the criterion measure of final grade due to grading variation.

Investigation of these constraints in prior analyses[8] found that because the validation studies conducted here in the SDCCD have relied on retrospective data obtained on an existing assessment and placement system which in effect pre-sorts students, the observed correlation coefficients may be lowered. This truncation of distributions into different course levels restricts the range of abilities and outcomes available for analyses. An application of restriction range does improve the relation between the test scores and the dependent variable as shown below in table 7. But this statistical artifact is of little value in validating a particular score on a test with the outcome measure of final grade.

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[8]Matriculation Report: Validating Placement Tests in the San Diego Community College District, The Relationship of Placement Test Scores, Biographical Data, and Grading Practices to Course Success, SDCCD Research and Planning, Spring, 1994

Prior analyses conducted by the research office also found several variables correlated with final grade using regression analyses, including variation in the dependent variable of final grade[9]. This report found several demographic and educational variables as significantly contributing to the prediction of final grade in several levels of English course. These included test scores, high school GPA, years out of school, employment hours planned, and environmental variables that may be instructor related.

Table 6
Correlation of APS Reading and Writing Tests with Outcome Measures
For English 101

Criterion	APS Reading	APS Writing	Combined
GPA*	.1797	2521	.2418
(N)	(796)	(796)	(796)
Probability	P= .000	P= .000	P= .000
MODGPA**	.1684	.2470	.2299
(N)	(1085)	(1085)	(1085)
Probability	P= .000	P= .000	P= .000

Note: 1-tailed Significance Levels are shown.
*GPA is a five point scale with A=4, B=3, C=2, D=1, F=0 all other notations are deleted from the analysis. ** MODGPA is a five point scale similar to GPA but includes D, F, W, NC as a score of 1. This model has been used in other validation studies conducted in the community colleges in California

Table 7 below shows the correlation of test scores with final grade obtained in three levels of English course. An application of restriction of range is also shown. This correction uses the smaller standard deviation found in cases where students have been distributed due to

[9] (ibid.)

the application of an existing testing scheme that in effect pre-sorts students thus restricting the range of available scores.

Table 7
Correlations, both Corrected and Uncorrected,
of APS Reading and Writing Test Score with GPA by Level of English

Course Level	**Transfer Level (101 and above) APS Reading**	**One Level Below Transfer**	**Two Levels Below Transfer**
Placement Test	Pearson r *(Corrected r)*	Pearson r *(Corrected r)*	Pearson r *(Corrected r)*
APS Writing	.25 *(.36)* P= .000* N=626	.30 *(.41)* P= .000 N=895	.29 *(.41)* P= .000 N=315
APS Reading	.18 *(.27)* P=000 N=626	.20 *(.30)* P=000 N=895	.11 *(.17)* P=000 N=315

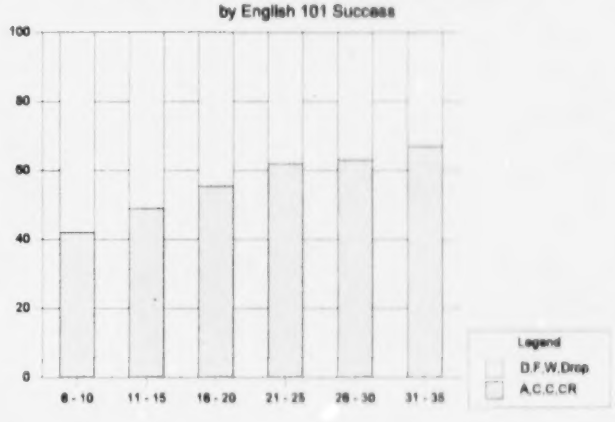
*Probabilities based on corrected Pearson correlation only

The data in table 7 indicate that the correlations between the placement test and the dependent variable improves with the application of a correction for restriction of range. In the

case of the APS writing test, the correlation surpasses a .35 correlation which has been regarded by state officials as indicative of sufficient criterion-related validity evidence for judging the statistical validity of the placement tests to a criterion of final grade. In the case of the reading test, the application of the correction for restriction of range, although improving the observed correlation coefficients substantially, does not achieve the targeted .35, although the correlations are positive and statistically significant. Graphical depictions of the relationship between scores on the APS Placement tests and success in English are shown in figures one and two below.

The relationship between APS Reading score and English 101 course performance is shown in figure 1. The proportion of students passing and failing English 101 is shown for different ranges of the APS Reading Placement test. As APS Reading Placement Test score increases, the proportion of students passing tends to increase. Passing English 101 is thus positively associated with higher APS Reading Placement test scores. When analyzed for all English courses, a similar trend was found as with English 101 course success. Using the above score ranges on the APS Reading Placement test, the proportion of students passing their respective English course is approximately 50% at the lowest ranges, to approximately 69% at the upper

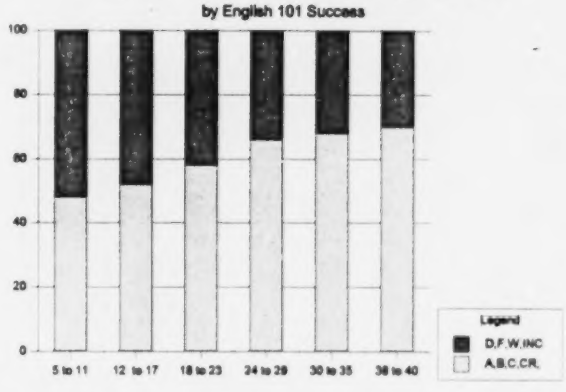
Figure 1: APS Reading Score



range.

The relationship between APS Writing Placement test scores and English 101 course performance is shown in figure 2. As APS Writing Placement Test score increases, the proportion of students passing tends to increase as well. Figure 2 also sugges ts that passing English 101 is associated with higher APS Writing Placement Test Scores. This same pattern of success is also found for all students in English courses. When analyzed for all English courses using the same score ranges identified in figures one and two, the proportion of students passing their respective English course based on APS Writing Placement test score ranges from approximately 48% at the lowest level to almost 70% at the highest levels. This is further evidence of the positive relationship between APS Writing Placement test and English course success.

Figure 2: APS Writing Score



Regression Analysis: English 101. To determine suitable predictors for use in a placement system that included placement test scores, multiple linear regression was used. The purpose of multiple regression analysis is to identify a group of student variables which optimally predict course performance. Potential predictor variables were those which were significantly correlated with course grade. These included high school GPA, Years of English in

High School, Grade in Last English Course, Years Since Last Attended School, and APS Placement Test Score. Multiple regression analysis showed that the APS Reading and Writing Placement test scores are significant predictors of English 101 course performance, even when other relevant variables are included in the model. For this analysis, the dependent variable was English course grade. This was selected because the assessment test's purpose is to predict success in English. If a student's chance of succeeding in English 101 is highly uncertain, the student is directed to enroll one or two levels below freshman composition in the reading and writing tracks that are foundation courses for freshman composition, depending on score achieved on both placement tests. For this analysis, withdrawals were included as non-successes to maintain a reliable sample size.

Analysis was performed using the stepwise regression procedure of the Statistical Package for the Social Sciences (SPSS). The summary table is shown below. The variable labeled Q9 is taken from the assessment survey and refers to years out of school for the respondent, highgpa is high school grade point average, and Q11 refers to the grade the student received in his or her last English course.

M U L T I P L E R E G R E S S I O N * * * *

Equation Number 1 Dependent Variable.. MODGPA

Summary table

Step	MultR	Rsq	F(Eqn)	SigF		Variable	BetaIn
1	.2291	.0525	43.723	.000	In:	TOTRDEN	.2291
2	.3158	.0998	43.660	.000	In:	HIGHGPA	.2176

3	.3858	.1488	45.871	.000	In: Q9	.2330
4	.3984	.1588	37.083	.000	In: Q11	-.1148

Standard Error of Est. 1.04481 Signif F Change .0024

Analysis of Variance

	DF	Sum of Squares	Mean Square
Regression	4	161.92405	40.48101
Residual	786	858.02032	1.09163

F = 37.08313 Signif F = .0000

APS Placement test scores entered the regression equation first, indicating that these combined scores were the strongest available predictor of English 101 course grade. The next variable to enter the equation was high school GPA. Additional variables to enter the equation from those specified for the model included length of time out of school (coded as 1=Still Enrolled, and 6= More than 10 years), and grade received in last English course (coded as 1=A, and 5=F, thus the negative association). Together the four variables combined for a multiple correlation of approximately .40 and a r-squared of approximately .16 indicating that approximately 16% of the variance in freshman composition is predicted by these four variables. The standard error of the estimate was 1.04. The final regression equation explained a highly significant proportion of the variance, F=38.08, ($p<.00005$).

Although APS Placement test score, High School GPA, Years Since Attended School, and Grade Received in Last English Course entered the stepwise regression model because of their significant relationship to the dependent variable of modified GPA, a practical useful approach to developing a multiple measures placement scheme militated for a simpler model.

There were several reasons for this. Chief among them had to do with response rates on the assessment survey form. For example, it was found that approximately twelve to fifteen percent of respondents from that term did not answer the high school GPA question. A somewhat higher proportion did not respond to the question about grade in last English course. Because multiple regression employs listwise rather than pairwise deletion of missing data, the proportion of missing data from these questions greatly reduces the number of cases available for study. In a practical sense, the more questions are relied upon to develop a placement recommendation, the greater the likelihood that a student will not have responded to one of the needed questions. This would result in greater time spent in obtaining the information from the student or referral to a counselor. In addition, a simpler model would be easier to explain and communicate to students, faculty, and counselors involved in the placement process. A simpler model would also facilitate modification of cut scores by limiting the number of considerations for modification to a minimum while still maintaining reliability in placement. Therefore, a second multiple regression was conducted that included only the first two variables to enter the equation described above. The summary table is shown below.

M U L T I P L E R E G R E S S I O N

Dependent Variable.. MODGPA

Summary table

Step	MultR	Rsq	F(Eqn)	SigF		Variable	BetaIn
1	.2265	.0513	57.036	.000	In:	TOTRDEN	.2265
2	.2984	.0891	51.523	.000	In:	HIGHGPA	.1948

```
Standard Error       1.08011          Signif F Change     .0000

Analysis of Variance
                     DF       Sum of Squares       Mean Square
Regression            2            120.21783          60.10891
Residual           1054           1229.64215           1.16664

F =       51.52295        Signif F =  .0000
```

The regression model that included high school GPA and the combined APS Placement test scores yielded a multiple R of .29 and a r-squared of .09. Although the proportion of variance explained was lower than the first model which included two additional variables, the sample size was much greater due to a lower number of missing responses, and the resulting proportion of the variance explained was still highly significant statistically. ($F=51.53$, ($p<.0005$).

APS Placement test score and high school GPA therefore reliably predicted grades in freshman composition. As stated above, it was determined that a straightforward method of calculating the combined predictor variable was needed. A simple formula (as opposed to a regression equation with decimal weights assigned to the variables in the model and had the advantage (in addition to those described above) in that individuals involved in the placement decision, counselors, faculty, and students, can readily calculate it. Of several simple formulas studied, the most effective and straightforward was found to be a combination of score ranges on both the APS reading and writing placement tests and high school grade point average from the assessment survey forms. To include high school grade point average which is a seven point scale with the APS Reading and Writing placement tests which are scaled from

1-35 and from 1-40, respectively, the placement tests were recoded to correspond to the seven point high school grade point average scale used on the assessment survey form. The recategorization of the placement tests into two scales of seven points each followed the scheme identified below.

Table 8
APS Reading and Writing Placement Scores and High School GPA Scale and Recategorized Scores based on Ranges for Each Variable

APS Reading	Reading Scale	APS Writing	Writing Scale	High School GPA	High School GPA Scale
1-5	1	1-4	1	0.0-0.9	1
6-10	2	5-11	2	1.0-1.4	2
11-15	3	12-17	3	1.5-1.9	3
16-20	4	18-23	4	2.0-2.4	4
21-25	5	24-29	5	2.5-2.9	5
26-30	6	30-35	6	3.0-3.4	6
31-35	7	36-40	7	3.5-4.0	7

This recategorization of the placement test scores thus parallels the high school GPA scale obtained from the CAPP survey form given during assessment. The recoding of the APS Reading and Writing placement tests results in two seven point scales, one from the APS Reading Placement test and the other from the APS Writing Placement Test.

High School GPA. At the time of assessment, students are asked to answer a survey regarding their educational goals, plans, and past academic performance. Question number 12 on the survey asks students to report their high school GPA using a seven point scale. The scale is reproduced in the preceding table and was the same scale used in the regression models to estimate final grade in English. This scale ranges from one to seven. This seven

This seven point scale is added to the seven point Reading scale and the seven point Writing scale. Thus: PREDICTOR=APS WRITING SCALE (7) + APS READING SCALE (7) + HIGH SCHOOL GPA SCALE (7)=21

In this formula, the APS Writing Scale and the APS Reading Scale is derived according to the scheme described in the above table, and added to the High School GPA scale to create a 21 point scale. Although as stated earlier, this reduced regression model has a lower r-squared than the full model considered initially, the resulting multiple R is still highly significant and is more parsimonious than the full model. Moreover, the standard error of the estimate is nearly identical to the full model (1.08). Also, inspection of the correlation matrix generated by the SPSS regression routine suggests a weak relationship between the combined APS Reading and Writing Placement tests and high school GPA ($r=.042$, $p=.117$). The new predictor (titled R1E1HSGP in the subsequent analyses). shows a relatively normal distribution as shown by figure 3. Descriptive statistics for the new English predictor are given below. The mean for the full sample is 13.3 with a standard deviation of 2.85, the median is 13, and the modal value was also 13. This suggests that the model has an approximately normal distribution with a minimum skew either positively or negatively. The observed standard error is .045. This relatively narrow standard error suggests that new predictor is a reliable scale. This is confirmed by inspection of figure three below. Quartiles are also given for the predictor.

Figure 3: Predictor Descriptive Statistics

Mean	13.313	Std err	.045	Median	13.000
Mode	13.000	Std dev	2.851	Variance	8.130
Range	16.000	Minimum	5.000	Maximum	21.000

Percentile	Value	Percentile	Value	Percentile	Value
25.00	11.000	50.00	13.000	75.00	15.000

Valid cases 4007

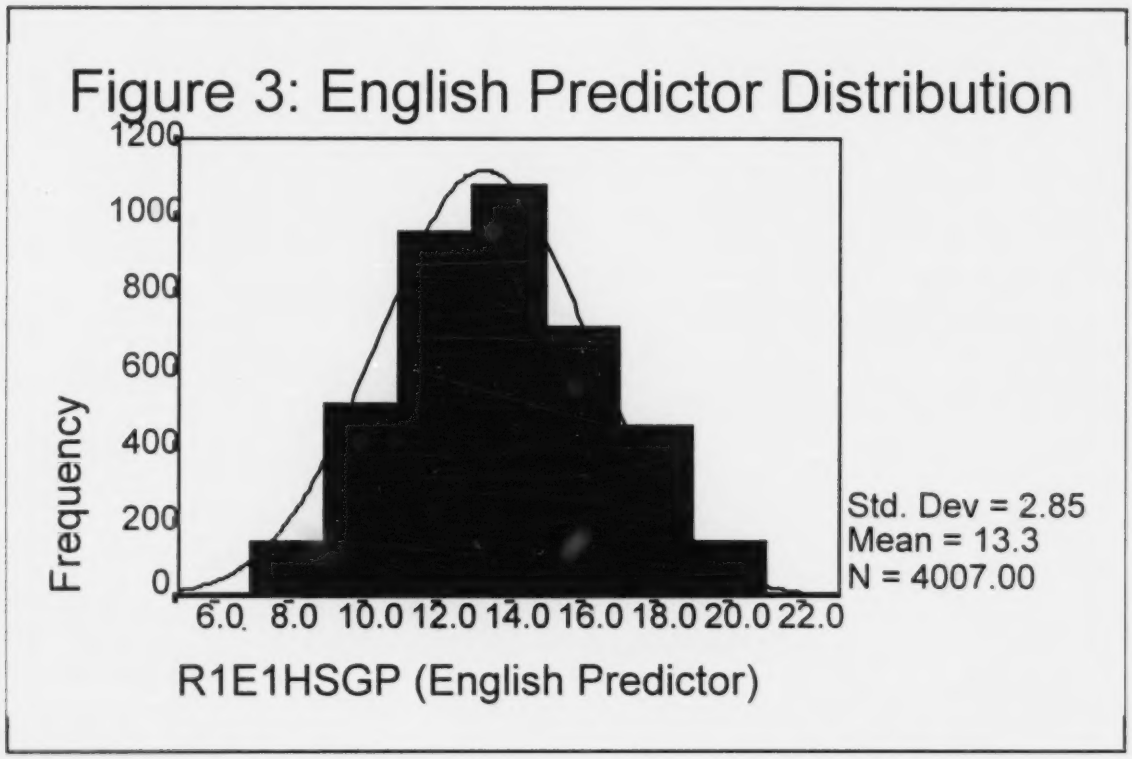


Figure 3

Distribution for English 101. For freshman English the predictor still shows a relatively normal distribution as shown by figure four (a mean of 15.5 and a standard deviation of 2.4) for the sample that took the English placement tests and enrolled in an English course in the fall, 1994 semester. The measures of central tendency suggest an approximately normal distribution with only a slight positive skew. The standard error for the freshman English sample is .063. Although slightly higher than the full sample, this standard

error is still relatively narrow and may be slightly higher due to attenuation of range by including only the freshman English group.

Figure 4: Predictor Descriptive Statistics for Freshman English

Mean	15.666	Std err	.063	Median	16.000
Mode	17.000	Std dev	2.357	Variance	5.554
Range	13.000	Minimum	8.000	Maximum	21.000

Percentile	Value	Percentile	Value	Percentile	Value
25.00	14.000	50.00	16.000	75.00	17.000

Valid cases 1414

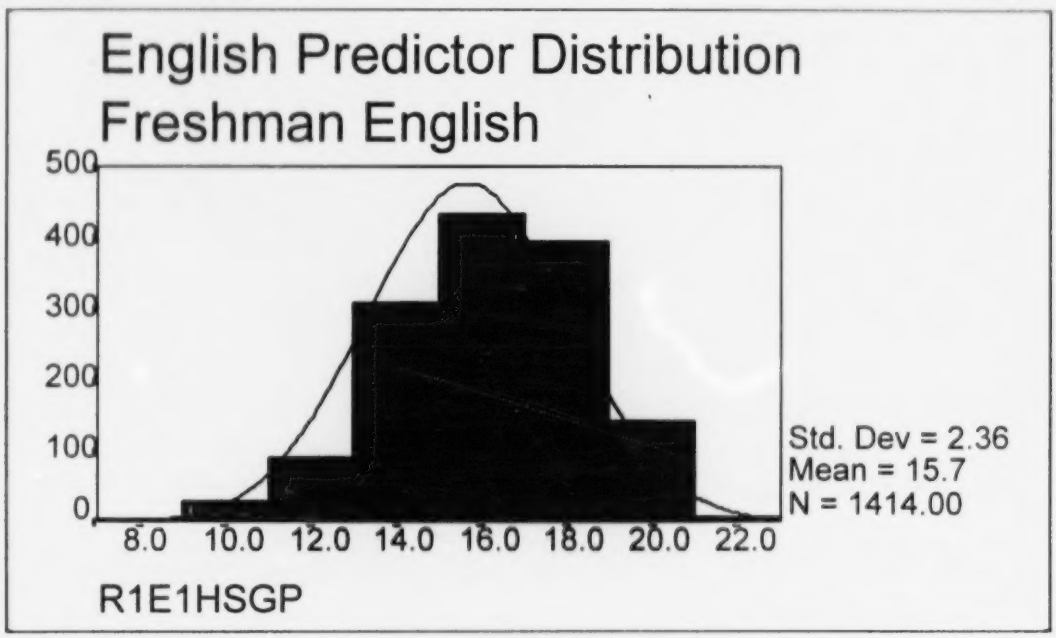


Figure 4

Referral to the English Curricular Tracks

If a student scores less than the recommended cut score of 15 on the English 101

Predictor scale, then they are referred to one or both of the reading and writing tracks that are below the freshman composition level. To have the placement system parallel the bifurcated English curriculum that have separate tracks for reading and writing below the freshman composition level, two scales from the predictor scale were broken out. This was done to determine placement within each track. Within these tracks, students must be referred to one level below freshman English (English 51 or English 56 or both) or two levels below freshman English (English 50 or 55 or both). For the both tracks a 10.5 point scale was developed with high school GPA recategorized into one-half of its original value and added to the existing seven point placement test scales described earlier. In this way high school GPA would still be weighted one-third for the new Reading and Writing Predictors. Thus the Reading and English Predictors for below freshman composition= Reading Predictor =(HSGPA (7 *.5) + Reading Scale(7)=10.5. Similarly for Writing the scale is the same with HSGPA comprising one-third of the recommended scale. Descriptive statistics for these scales for the below 101 group (i.e., below 15 on the English 101 predictor) show that for the Reading Predictor the average score is 5.6 with a standard deviation of 1. The standard error for the Reading Predictor is .021. For the Writing Predictor the mean score is 6.0 with a standard deviation of 1.0 and a standard error of .20. Both the Reading and Writing predictors for below the freshman composition level show approximately normal distributions with a narrow standard error. The distributions are shown in the next two figures.

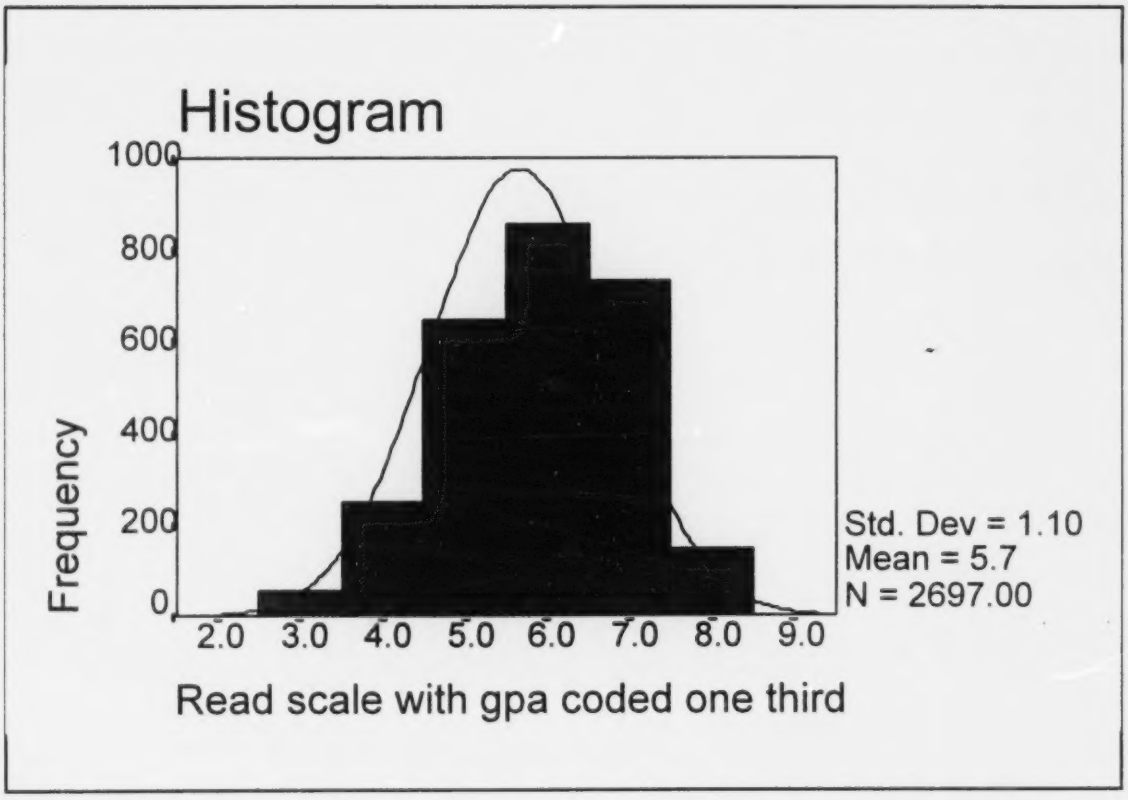

Histogram
1000
800
600
400
200
0
Frequency
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
Std. Dev = 1.10
Mean = 5.7
N = 2697.00
Read scale with gpa coded one third

Figure 5

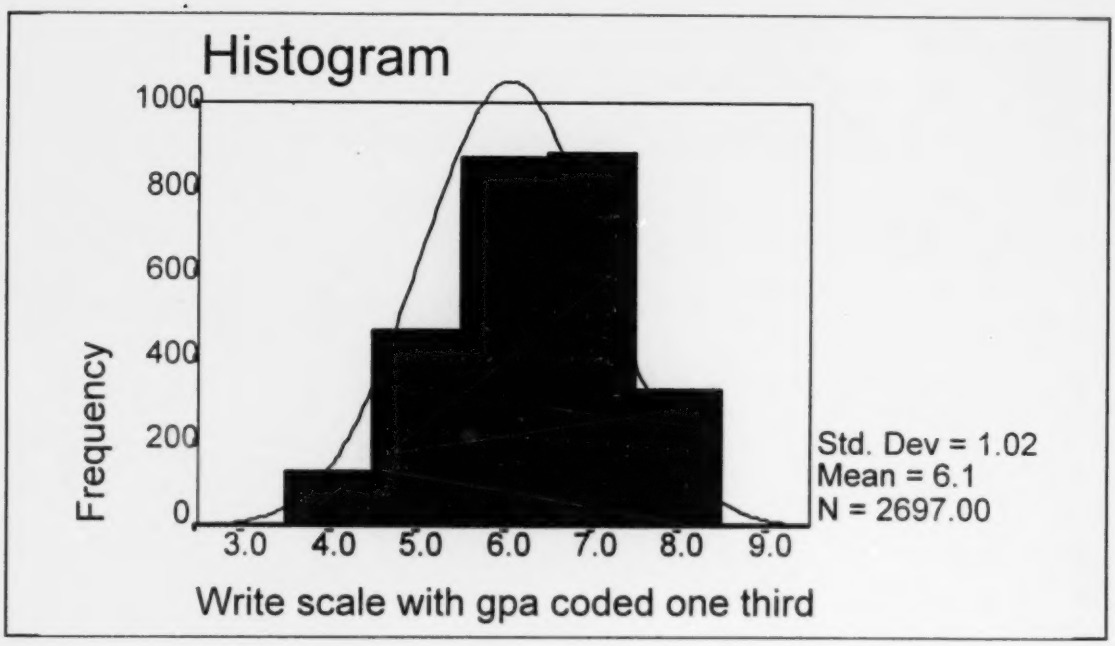


Figure 6

Both the Reading and Writing Predictor scales show criterion- related validity evidence similar to that found for the English 101 predictor scale. This is shown in the correlation matrix below. Both the Reading and Writing Predictors for the levels below freshman composition are statistically significant. It is expected that a corrected Pearson correlation coefficient would boost these observed correlation substantially.

	Reading Predictor	Writing Predictor
GPA	.1458	.1735
	(1516)	(1516)
	P= .000	P= .000

Criterion-Related Validity Evidence Summary

The evidence gathered and presented in the preceding analyses suggests that the APS Reading and Writing Placement tests therefore show acceptable criterion-related validity. The hypothesized English 101 Predictor scale based on a combination of Reading and Writing placement tests and high school GPA also show acceptable criterion-related validity. In addition, the sub-scales of the English 101 Predictor for both Reading and Writing tracks also show acceptable levels of criterion related validity. The statistical evidence presented in the correlation matrices and crosstabulations is also supported by alternative evidence gathered by special Matriculation surveys of students and faculty conducted by the Research department which also provides criterion-related validity evidence of the validity of the APS Placement tests to course success.

Reliability Evidence

One indicator of the reliability or stability of the placement tests is a comparison of scores over time and across settings. To provide evidence for the reliability of the placement tests, four samples of the SDCCD testing population were analyzed for various semesters from the period of fall, 1988 through fall, 1995. The tables that follow below present data from the fall, 1988, fall, 1990, fall, 1994, and fall, 1995 tested populations to enable comparisons of the scores for each of the colleges over a seven year period. The similarity of scores over time suggest that the tests are generally reliable. A prior study conducted by the SDCCD Research office analyzed and compared the norming groups used by APS with the SDCCD testing population to determine if there were significant differences between the two groups

when examined by scores. This study determined that although there slight differences between the two groups when measured by average scores, it was shown that there were significant differences between the norming group used by APS and the SDCCD tested population.[10]

Scores over Time, 1988-1995. Table 9 below shows test scores from four different testing samples over a seven year period. Means, standard deviations and sample sizes are given to enable comparison of test scores during this period. This analysis of four fall semesters provides evidence of APS test reliability with the SDCCD student population because of the approximate similarity of test scores over time.

Table 9
Means, Standard Deviations and Distribution of Placement Scores
SDCCD Tested Population

Year	City Reading Mean (SD) N	City Writing Mean (SD) N	Mesa Reading Mean (SD) N	Mesa Writing Mean (SD) N	Miramar Reading Mean (SD) N	Miramar Writing Mean (SD) N	ECC Reading Mean (SD) N	ECC Writing Mean (SD) N	SDCCD Reading Mean (SD) N	SDCCD Writing Mean (SD) N
1988	19.0 (7.9) 2671	23.0 (7.2) 2669	22.0 (6.3) 692	25.6 (6.2) 692	21.0 (7.3) 1110	24.7 (7.3) 1110	13.2 (7.2) 201	17.9 (7.7) 201	20.0 (7.7) 4676	23.5 (7.2) 4676
1990	18.2 (7.3) 1122	21.3 (7.0) 1122	20.4 (6.8) 1463	23.8 (6.8) 1463	19.2 (6.8) 470	23.4 (6.7) 470	17.4 (7.3) 221	20.1 (7.0) 221	19.3 (7.0) 3277	22.7 (6.9) 3277
1994	17.0 (7.1) 1542	19.7 (6.8) 1543	18.7 (7.3) 2068	23.4 (6.8) 2068	17.3 (7.4) 716	22.8 (7.2) 716	15.3 (6.5) 118	18.7 (6.0) 118	17.8 (7.3) 4326	22.0 (7.0) 4327
1995	18.5 (7.6) 1209	21.7 (7.1) 1210	19.4 (7.2) 1398	24.0 (6.6) 1398	19.9 (7.3) 590	22.8 (7.2) 590	*	*	19.2 (7.4) 3197	23.0 (6.9) 3197

[10]Skills Testing and Disproportionate Impact: An Analysis of the Reading and Writing Test Performance of Students in the San Diego Community College District. SDCCD Research Office, Spring, 1991

* Data for ECC not available fall 1995

When examined for each of the colleges and ECC in 1988, scores on the reading test appear generally similar with the exception of the college courses offered at ECC. For City College, the average score on the reading test was approximately 19, with a standard deviation (SD) of approximately eight. For Mesa College, the average score was slightly higher at 22.0, with a standard deviation of approximately 6.3. Reading scores for the Miramar tested population was approximately midway between City and Mesa Colleges at about 21.0 with a standard deviation of 7.3. Although differences exist among the three college campuses, they lie within the error of measurement reported by the test publisher and confirmed by this study. At the Educational Cultural Complex, scores on the reading test were significantly lower ($p < .05$) than the mean scores reported by the other three sites.

A similar pattern of test performance can be observed with respect to average scores on the Writing test. As indicated in table 9 above, the City College sample had slightly lower scores on the APS Writing test than did either the Mesa or Miramar samples. As with the reading test, the differences while statistically significant (primarily due to large sample size), are of limited practical significance. For the 1990 sample, means and standard deviations by campus were again computed and analyzed. Although there appears to be a slight downward trend, the differences between the two terms do not appear to be important. The 1994 sample appeared to suggest a continuing trend downward in average test scores, however, by 1995 this trend had started to move back to the 1988 levels in both Reading and Writing. The average scores in 1988 was 19.6 for the Reading test and 23.5 for the total SDCCD. The

scores in fall 1995 were 19.2 for Reading and 23.0 for Writing. Comparison of these data provide additional evidence of the reliability of the test scores from year to year, for four different testing cohorts. It shows that over the seven year period, the scores achieved on the APS placement tests by successive testing cohorts are generally similar. This finding obtains despite expressed concerns by many in the college community over the perceived declining academic skills of students coming to the colleges. Thus analysis of scores obtained on the APS Placement tests over a seven year period are within one or two points of the average scores observed over a seven year period for four different cohorts. It also appears that the reading and writing abilities of college freshman as measured by the placement tests has remained relatively stable over the years analyzed.

Reliability of Predictor. The reliability of the predictor was analyzed by comparing the English predictor scores of two successive testing cohorts.

Table 10
Fall, 1994 and Fall, 1995 Predictor Means

Term N	Predictor Mean	Standard Deviation	Standard Error
Fall, 1994 4007	13.3	2.85	.045
Fall, 1995 4655	13.6	2.89	.030

The distributions for the two terms analyzed for reliability evidence appear very similar with relatively narrow standard deviations. The following two figures illustrate the distributions of the predictor means for two successive fall testing cohorts. Figure 7 below shows the

distribution of the 1994 Predictor. Figure 8 shows the fall, 1995 distribution of the Predictor. These distributions further confirm the stability of the predictor scale.

Figure 7
Fall, 1994 Predictor Mean and Descriptive Statistics

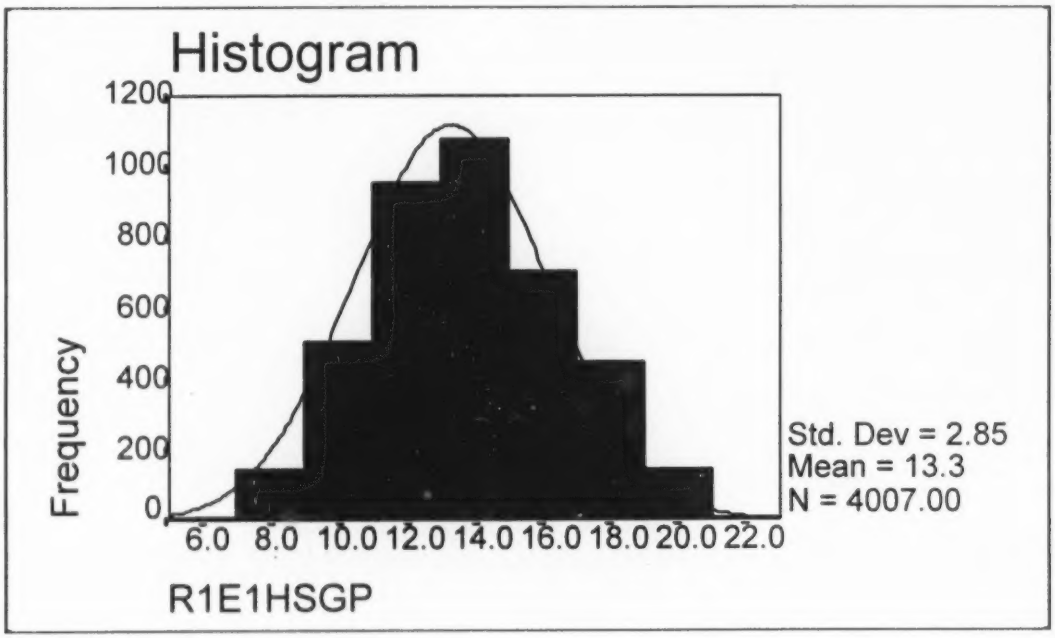
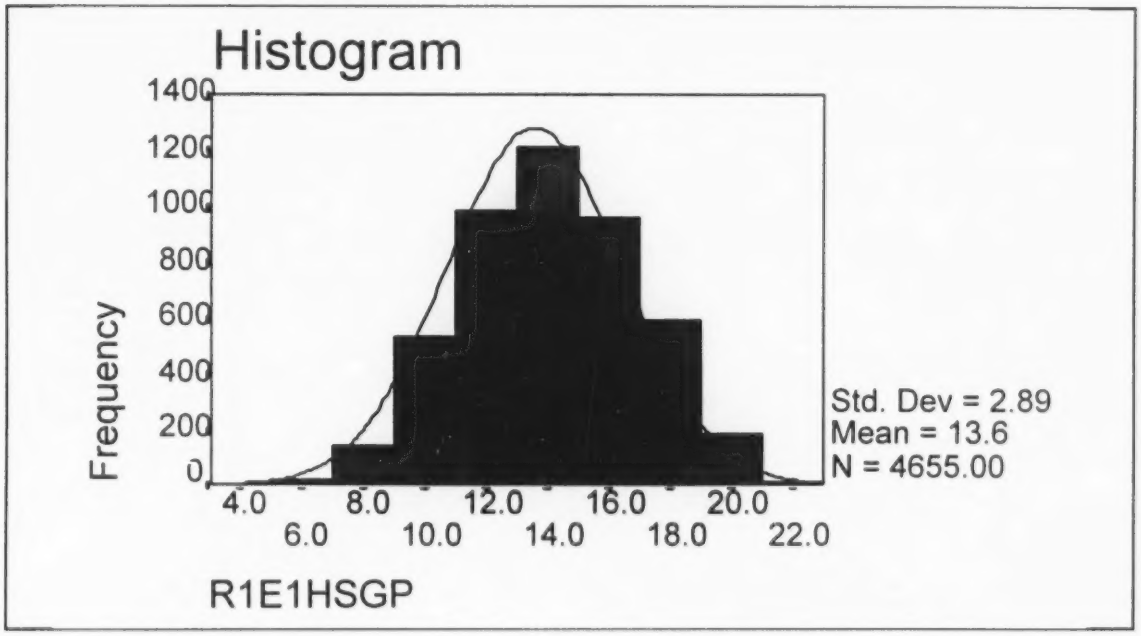


Figure 8
Fall, 1995 Predictor Distribution and Descriptive Statistics



In summary, both the APS Placement scores and the derived prediction equation show stability over time. The means of the scores for two successive terms of the predictor are remarkably similar.

Test Bias and Disproportionate Impact

From the Publisher: The technical manual does not specifically address disproportionate impact issues related to the APS placement tests. They focus primarily on the fact that minority students were approximately one-fourth of the norming sample and thus the norming data reflect the characteristics of a large proportion of ethnic minorities. They also assert that because the tests were normed on a representative sample of community college students, that the tests are an accurate and fair measures of English ability and competence to challenge

college level course work. No separate discussions of the impact of the tests on students by age or gender groupings were in the technical manual accompanying the tests.

Local Studies. Local studies suggest that the APS English and Reading Placement tests show little disproportionate impact. A disproportionate impact study conducted locally indicated that although certain groups of students performed more poorly on the placement tests, that these differences were largely attributable to educational background and differences in English communication skills[11]. For example the research found differences among the various ethnic and linguistic groupings with respect to the grade they reported receiving in their last English class. White students reported higher percentages of A and B grades in their last English class compared with all other students. This was viewed as evidence that differences in the average scores achieved by non-white students could, at least in part, be attributed to prior achievements in English courses. In addition, there were differences found in the high school GPA of certain non-white groups such as Black and Latino students compared with White, Pacific Iislander, and Asian students with the latter groups indicating higher GPA's in high school. This information helped to account for the observed differences noted in the performance of these student groupings on the APS Placement tests. Finally, a large proportion of Asian and Latino students reported a language other than English as their primary language, this was also believed to have affected their performance on the English

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[11]Skills Testing and Disproportionate Impact: An Analysis of the Reading and Writing Test Performance of Students in the San Diego Community College District. SDCCD Research and Planning, Spring, 1991

placement tests.

Table 11 below compares locally obtained average APS Reading and Writing placement test scores for groups by sex, ethnicity, and age. Predictor scores (Predictor=high school GPA plus recategorized APS Reading and Writing Placement) means are also compared.

Table 11
APS Reading and Writing and Predictor Means by Sex, Ethnic, and Age Groupings

Group	APS Reading (SD)	APS Writing (SD)	N	Predictor (SD)	Predictor Reading (SD)	Predictor Writing (SD)
Males	18.5 (7.6)	21.7 (7.0)	2091	13.3 (2.8)	6.6 (1.6)	6.7 (1.4)
Females	17.3 (6.9)	22.3 (7.0)	2188	13.3 (2.8)	6.4 (1.6)	6.9 (1.4)
Whites	21.6 (6.9)	25.5 (6.4)	1419	14.5 (2.7)	7.1 (1.6)	7.3 (1.4)
Nonwhites	16.6 (6.7)	20.0 (6.5)	2754	12.6 (2.6)	6.1 (1.5)	6.5 (1.3)
Age 17 & Under	20.5 (7.4)	25.5 (6.5)	57	15.2 (2.7)	7.4 (1.6)	7.7 (1.3)
18-21	17.6 (6.9)	22.4 (6.8)	2697	13.5 (2.8)	6.5 (1.6)	6.9 (1.3)
22-25	19.5 (7.3)	22.3 (6.9)	589	13.3 (2.8)	6.7 (1.6)	6.6 (1.4)
26 & over	17.4 (8.0)	20.5 (7.6)	979	12.7 (3.0)	6.3 (1.7)	6.4 (1.5)
Total	17.8 (7.3)	22.0 (7.0)	4322	13.3 (2.9)	6.5 (1.6)	6.8 (1.4)

For the APS scores and Predictor scores, the ethnic, gender, and age differences are

statistically significant, although in the case of gender, the differences are the smallest. Whites score significantly higher than non-whites, and younger students tend to perform somewhat better on all measures than do older students. In the case of gender however, the proportion of variance accounted for by this variable is small. The eta-square statistic is .009, indicating that less than 1% of the variance in the case of the Reading test is explained by gender. The proportion of variance explained by gender for the Writing placement test is also less than 1%. Thus, although the differences are statistically significant, the proportion of variance accounted for by gender is minimal. Over 98% of the variance found between men and women is not explained by differences in gender. The ethnic differences (coded as white/nonwhite) are also statistically significant. As pointed out in the Disproportionate Impact study however, much of the observed differences between groups was attributable to differences in preparation and prior academic achievement in high school. This analysis is also complicated by the large number of non-native English speakers electing to take the English placement tests rather than the CELSA test for non-native speakers. Prior analysis has shown that non-native speakers attempt fewer questions and have more difficulty answering the self-assessment questions than native speakers. This ESL group is also included largely in the nonwhite category. The eta-squared statistic for the white and nonwhite comparison groups is .14, indicating that about 14% of the variance in Reading and the Writing score was explained by ethnic grouping. The proportion of variance explained by age grouping was 1% for both the Reading and Writing tests.

When the new predictor is analyzed however, the proportion of variance explained by student grouping drops. In the case of gender, the eta-squared drops to non-significance

indicated by a statistic of less than .0001. Ethnic differences also diminish. Where the proportion of variance in test score explained by ethnic grouping was approximately 14%, the eta-square for the predictor drops to 10% of the variance. This suggests that the new predictor helps to mitigate potential disproportionate impact of the assessment process through the addition and weighting of high school GPA. The proportion of variance accounted for age grouping also drops using the new predictor. The eta-square statistic shows that less than 2% of the variance is explained by age category. Thus it appears that the new predictor does substantially mitigate potential disproportionate impact in the case of ethnic grouping, and reduces it to non-significance for sex and age groupings.

Similar comparisons to monitor potential test bias or disproportionate impact were conducted using two predictors that are derived from the English 101 predictor. These scales, titled Predictor Reading and Predictor Writing in the preceding table, were developed to refer students scoring below the 101 level to one or both of the Reading and Writing curricular tracks in the English department. As described above, these scales are simply the respective placement test (e.g., Reading Test for reading track (English 55 and 56), Writing Test for writing track (English 50 and 51), and are used to refer students who score below the recommended cut off of 15 on the English 101 Predictor score. These new scales also mitigate potential disproportionate impact by reducing the eta-square statistic to less than 10% of the variance explained by ethnic grouping for Reading, and approximately 8% of the variance for Writing. At the lower levels, the new predictors also mitigate the potentially biasing effects of testing.

Score Grade Correlations for APS Placement Tests and English Predictor by Ethnic Grouping. To further analyze the potential for mitigating disproportionate impact, separate correlational analyses were conducted for the white-non-white student groupings. This was done because the largest differences were observed for these two groups in terms of test and predictor scores. The following table summarizes these coefficients. The results suggest that when the new predictors are employed that include high school GPA, the strength of the correlation coefficient improves for both groupings. The correlations for the non-white students is on par with that of the white students, and in some cases is slightly higher. In all cases the correlations are statistically significant.

Table 12
Score-Grade Correlations for APS Placement Tests by White-Non White Groupings

Measure	White GPA	Nonwhite GPA
APS Reading (N) Sig.	.1745 (850) P=.000	.1354 (1566) P= .000
APS Writing (N) Sig.	.2151 (850) P=.000	.1830 (1567) P= .000
Reading Predictor (N) Sig.	.2265 (807) P=.000	.2282 (1440) P= .000
Writing Predictor (N) Sig.	.2477 (807) P=.000	.2598 (1440) P= .000
101 Predictor (N) Sig.	.2543 (807) P=.000	.2623 (1440) P= .000

Nearly all correlations are comparable in value for the white/non white groupings. Thus both the APS and the three Predictors (English 101, Reading and Writing for below 101 are significantly correlated with course performance for these two groups. Similar correlational analyses were conducted for gender and age groupings, and a similar pattern of correlations were found. The new Predictors for English 101, and below freshman composition improve the observed coefficients for both men and women, and for both younger and older students with little appreciable differences between these various groupings on the

dependent variable of final grade. Also, extensive analyses of potential disproportionate impact and test bias are contained in a technical appendix to this report and is bound separately. In this technical appendix data were analyzed using age, race, ethnic, and primary language of the fall, 1994 tested population. This report is included in the SDCCD Test Validation portfolio available for review in the Research and Planning office and at the colleges.

Fairness in Placement: Alternative Evidence. As described in previous reports done by the Research office, student surveys analyzed by ethnic and gender grouping show few differences in terms of perceived fairness and equity of the assessment and placement process. The special Matriculation Surveys conducted for the campuses as well as districtwide suggest that students vary little in their satisfaction with regard to the assessment process by either ethnic or gender grouping. [12]

Cut and Placement Scores

Local Studies

The primary goal for establishing a preliminary cut score was to achieve the highest success rate while still allowing the greatest number of potentially eligible students to enroll in English 101. Additionally it was sought to maximize the proportion of correctly placed students compared to the baseline success rate while still maintaining access for the greatest number of students. Table 13 below shows various statistics for a range of plausible cut

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[12]Student Equity and Satisfaction with Matriculation Services in the SDCCD, SDCCD Research and Planning, 1995.

scores for English 101. In this analyses, success is defined as receiving a grade of A, B, C, or Credit in the course. Non-success included all other transcript notations except drop. As the second and third columns show, cut scores in the range of 14 to 15 would result in approximately 40% of eligible students passing and from approximately 7% to 12% of ineligible students passing. These cutoffs would also place the most students accurately (approximately 58%). In consultation with the English department leadership, a score of 15 on the freshman composition predictor was selected as the tentative skill level recommended for placement into English 101. Again, a caveat to this study is that these data are retrospective data. Students had been pre-sorted under a prior placement scheme, thus a large proportion of students may have been screened out due to ineligibility under the existing system. This pre-sorting has the effect of complicating interpretation of cut score tables because of the truncation of the range of abilities available for analysis.

Table 13
Cut Score Statistics for English 101

Predictor Score	% Ineligible Passing	% Eligible Passing	Correctly Placed	Adds to Base line	Number Eligible	% Eligible
11	2.9	47.3	50.2	0.0	783	94.1
12	3.3	46.9	51.5	1.3	721	92.1
13	4.3	45.8	52.6	2.5	696	88.9
14	6.9	43.3	55.4	5.2	634	81.0
15	11.7	38.4	57.7	7.6	540	69.0
16	19.3	30.9	58.5	8.3	416	53.1
17	28.5	21.7	56.7	6.5	286	36.5

The baseline rate of passing English 56 was approximately 52% (N=772) for this validation sample (i.e., without a cut score based on this predictor variable, 52% of these students passed English 56 with a grade of C or better. Cut scores of 15 and 16 raise the success rate by the largest margin. However a cut score of 16 dramatically reduces the proportion of students eligible for freshman composition. (Approximately 70% are eligible at a score of 15, while about 50% are eligible at a score of 16). A cut score of 15 places almost 60% of the sample correctly, with a corresponding increase of 8% to the baseline rate of success. The trade-off between proportion eligible and baseline improvements to the success rate begin to diminish at the upper levels as illustrated in the table when the cut score increases.

Thus recommendations were made to the English department chairs to test a score of 15 for referral to freshman composition. This recommendation was implemented and is currently being tested with new students. Future reports will continue to monitor this placement recommendation.

Cut Scores for Below Freshman Composition

As described earlier in the development of the English 101 predictor, separate scales were derived from the English 101 predictor to refer students to needed foundational courses in either Reading, Writing, or both to prepare for freshman composition. Cut score statistics were also produced for English 56 and English 51 to determine cut scores and baseline improvements for success rates similar to those produced for English 101 in the above table. English 50 and 55 are basic skills courses for which there is not a prerequisite for entry. The caveats that applied to the interpretation of the cut score tables earlier also apply to the analysis that follows. Students in the validation sample had been pre-sorted using an existing

placement scheme. These retrospective data then reflect the limitations of using these statistics when an existing assessment system is used to place students. These tables must be interpreted with care. The cut score tables for English 51 (Writing Course) and English 56 (Reading Course) are reproduced below.

Table 14
Cut Score Statistics for English 56 Using Reading Predictor

Predictor Score	% Ineligible Passing	% Eligible Passing	Correctly Placed	Adds to Base line	Number Eligible	% Eligible
4.5	22.0	53.8	54.9	2.6	736	93.3
5.0	29.0	54.6	56.0	3.7	703	91.1
5.5	41.2	55.6	56.5	4.2	595	77.1
6.0	44.9	57.2	56.5	4.2	467	60.5
6.5	50.1	56.4	52.1	-.02	273	35.4
7.0	51.7	56.6	49.4	-2.9	99	12.8

This validation sample for English 56, as with the other data in this report use retrospective data obtained from the fall, 1994 tested population in the SDCCD. The number of cases available for analysis in the English 56 cut score validation study is 772. For the 10.5 Reading Predictor scale cut score statistics are produced above. A range of plausible cut scores is shown in the table above for English 56. A cut score of from 5.5 to 6.0 resulted in the largest additions to the baseline while still allowing for access. In consultation with the English department and student services leadership a tentative cut score of 6.0 was recommended for referral to English 56. This was selected because it added to the baseline

rate, but also out of concerns that students indicating the highest high school GPA (i.e., a score of 3.5) would be eligible for English 56 even with very low test scores. It was the judgement of the teaching faculty that the distributions shown here and based on simulations using the new model would be the most prudent. Students scoring below the freshman composition level would be directed into English 56 with a minimum score of 6.0 on the Reading Predictor scale. The system is currently in place and will be monitored for its impact on student eligibility and success rates.

Table 15 below contains cut score statistics for the Writing Predictor scale for students falling below the freshman composition level on the Predictor who should enroll to improve writing skills in preparation for college level English. A range of plausible cut scores based on the 10.5 Writing Predictor scale are shown below. A score of 6.5 results in the highest addition (approximately 8%) to the baserate of success for English 51 for this validation sample (N=523). Also the English department leadership felt as they did with the referrals to English 56, that students who indicated the highest GPA possible yet still scored very low on the Reading Placement test scale should be placed in the basic skills writing course, English 50. Using their professional judgement, discipline faculty in English selected 6.5 as the tentative cut off for eligibility for English 51.

Table 15
Cut Score Statistics for English 51 Using Writing Predictor

Predictor Score	% Ineligible Passing	% Eligible Passing	Correctly Placed	Adds to Base line	Number Eligible	% Eligible
5.0	37.1	50.8	51.6	1.6	488	93.3
5.5	36.1	53.1	55.0	5.0	426	81.5
6.0	37.2	55.7	57.9	7.9	359	68.6
6.5	42.8	59.3	58.1	8.1	226	43.2
7.0	46.8	60.9	54.9	4.9	115	22.0
7.5	47.6	73.9	54.3	4.3	46	8.8

This cut score for the Writing Predictor will be also be monitored for impact on the eligibility and success rates of students.

Summary

Using a variety of evidence from a diversity of sources including statistical analyses, student survey data, and faculty surveys, this study suggests that the APS Placement Tests have acceptable criterion-related validity for placing students in the English curriculum. Although it must be noted that this study did rely on retrospective data that used students in a sample that had been pre-sorted using a pre-existing placement system. Thus the results must be interpreted with caution. This retrospective study identified several variables that correlated significantly with success in English courses. Foremost among these were high school GPA, years of English completed, grade in last English class, and number of years out of school. Stepwise multiple regression procedures identified high school GPA as the strongest predictor along with the combined APS Reading and English Placement Test scores.

To obtain the simplest and most understandable measure, and one that can be practically collected, it was decided to include high school GPA as part of a new predictor scale. To accomplish this, the Reading and Writing Placement tests were each recategorized into a seven point scale and added to the existing seven point scale for high school GPA. This new scale ranged from 3 to 21 with high school GPA counting for one-third of the total. The new distribution appeared approximately normal and the measures of central tendency tended to confirm the normality of the distribution. This English 101 Predictor scale was found to have higher correlations with the dependent variable of final grade in English than the APS tests did alone. Further it was found that high school GPA was not highly correlated with the placement tests scores. For placement below the freshman composition level, two scales derived from the English 101 predictor scale were tested. Both showed statistically significant correlations with the criterion variable of final grade. In the Reading and Writing Predictor scales, as with the Freshman Composition Predictor, high school GPA accounts for one-third of the total scale for a range of 10.5 points (Reading or Writing =7 + high school GPA =3.5).

When monitored for disproportionate impact, it was found that the new measure mitigated the effects of student ethnicity, gender, and age in explaining variance in final grade. Of the three student groupings analyzed, ethnicity seemed to have the largest proportion of variance of final grade. Separate correlations were run for whites and non-whites and suggested that the correlations for non-white ethnic groupings were almost equivalent to those found for white students. Extensive analyses of potential disproportionate impact were also conducted and are included in a technical appendix bound separately from this report.

Cut score statistics and validation tables showed the proportion of eligible and ineligible students passing and the amount of improvement in the baseline success rates at several plausible cut scores. Discipline faculty selected a score of 15 on the English 101 Predictor. For English 56 a score of 6.0 for eligibility was selected. On the Writing Predictor scale, a score of 6.5 was selected by the faculty as the new tentative cut scores. The Research office will continue to report and monitor the effects and impacts of these scales and cut scores on the eligibility and success rates of students.

Appendix A

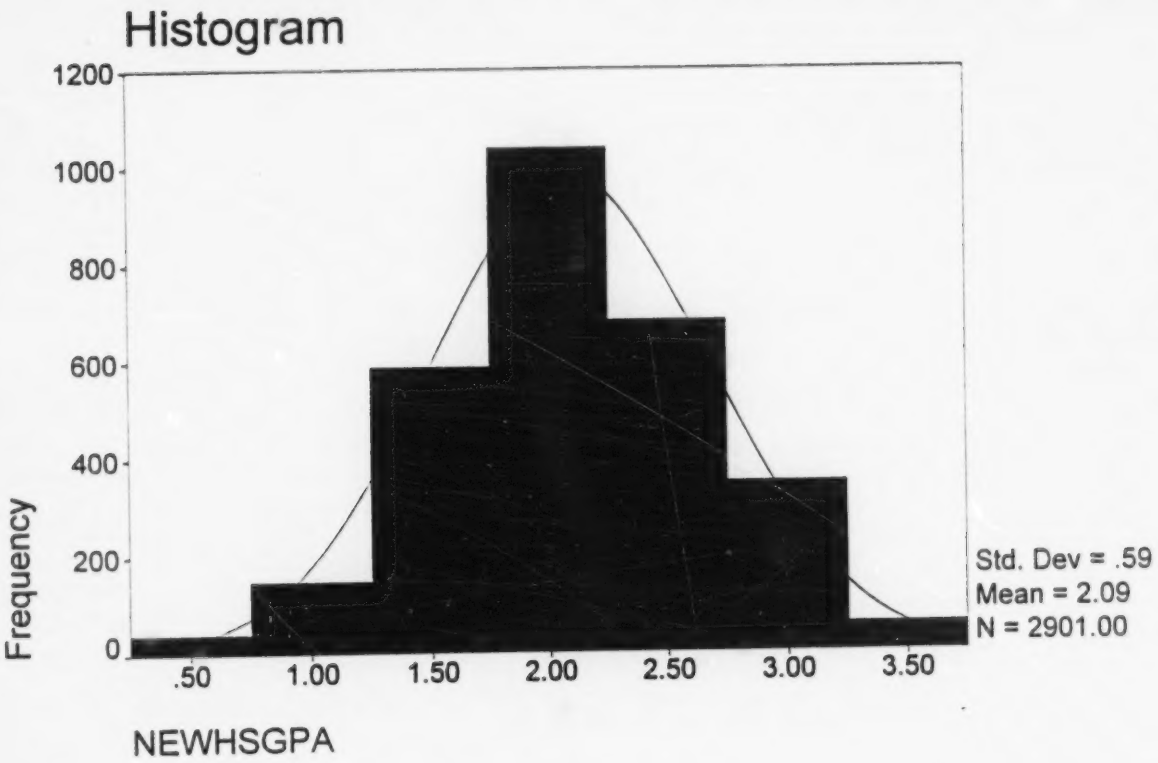
Descriptive Statistics of Sample and Score Distributions of APS and English Predictors based on Test Scores and High School GPA

Distributions of Placements Using Modified Reading and Writing Scale with High School GPA Reduced to One Third of Respective Scales

Course	New HSGPA Score	Multiple Measure Scale	Number Eligible	Number Inelig.	Percent Eligible	Percent Ineligible	N	APS Number Eligible	Number Inelig.	Percent Eligible	Percent Inelig.	N
101	15+	Reading Writing HSGPA	1754	2901	37.7%	62.3%	4655	1922	3069	38.5%	61.5%	4991
101	14+	Reading Writing HSGPA	2362	2293	50.7%	49.3%	4655	1922	3069	38.5%	61.5%	4991
56	5.0	Reading	2281	620	78.6%	21.4%	2901	771	878	46.8%	53.2%	1649
56	5.5	Reading	1898	1003	65.4%	34.6%	2901					
56	6.0	Reading	1512	1389	52.1%	47.9%	2901					
56	6.5	Reading	1023	1878	35.3%	64.7%	2901					
56	7.0	Reading	567	2334	19.5%	80.5%	2901					
51	5.0	Writing	2597	304	89.5%	10.5%	2901	1068	581	64.8%	35.2%	1649
51	5.5	Writing	2288	613	78.9%	21.1%	2901					
51	6.0	Writing	1900	1001	65.5%	34.5%	2901					
51	6.5	Writing	1323	1578	45.6%	54.4%	2901					
51	7.0	Writing	815	2086	28.1%	71.9%	2901					

Note: Under new multiple measures scheme, there are no ESL referrals based on APS test scores, high school GPA, and student survey responses. Previous system did include ESL referrals. The data for the APS (single measure scheme) does not include those eligible for ESL only. For the multiple measure scale data, all students are considered eligible for the two lowest level English courses. This may have the effect of increasing those eligible for English 50 and 55.

In the table above, the Reading and Writing scale have been converted into scales with a range from 1.5 to 10.5. High school GPA has been reduced from a seven point scale to a 3.5 point scale using the following schema: A score of seven (self reported GPA of 'A') is now coded as a 3.5, a score of 6 (B-B+) is a 3, etc. This has the effect of reducing the proportion of self reported high school GPA to one-third of the scale.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1000
800
600
400
200
0
Frequency
.50
1.00
1.50
2.00
2.50
3.00
3.50
NEWHSGPA
Std. Dev = .59
Mean = 2.09
N = 2901.00

NEWHSGPA

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
	.50	41	1.4	1.4	1.4
	1.00	148	5.1	5.1	6.5
	1.50	587	20.2	20.2	26.7
	2.00	1038	35.8	35.8	62.5
	2.50	682	23.5	23.5	86.0
	3.00	348	12.0	12.0	98.0
	3.50	57	2.0	2.0	100.0
	Total	2901	100.0	100.0	

Hi-Res Chart # 4:Histogram of newhsgpa

Mean	2.094	Std err	.011	Median	2.000
Mode	2.000	Std dev	.590	Variance	.348
Maximum	3.500				

Valid cases 2901 Missing cases 0

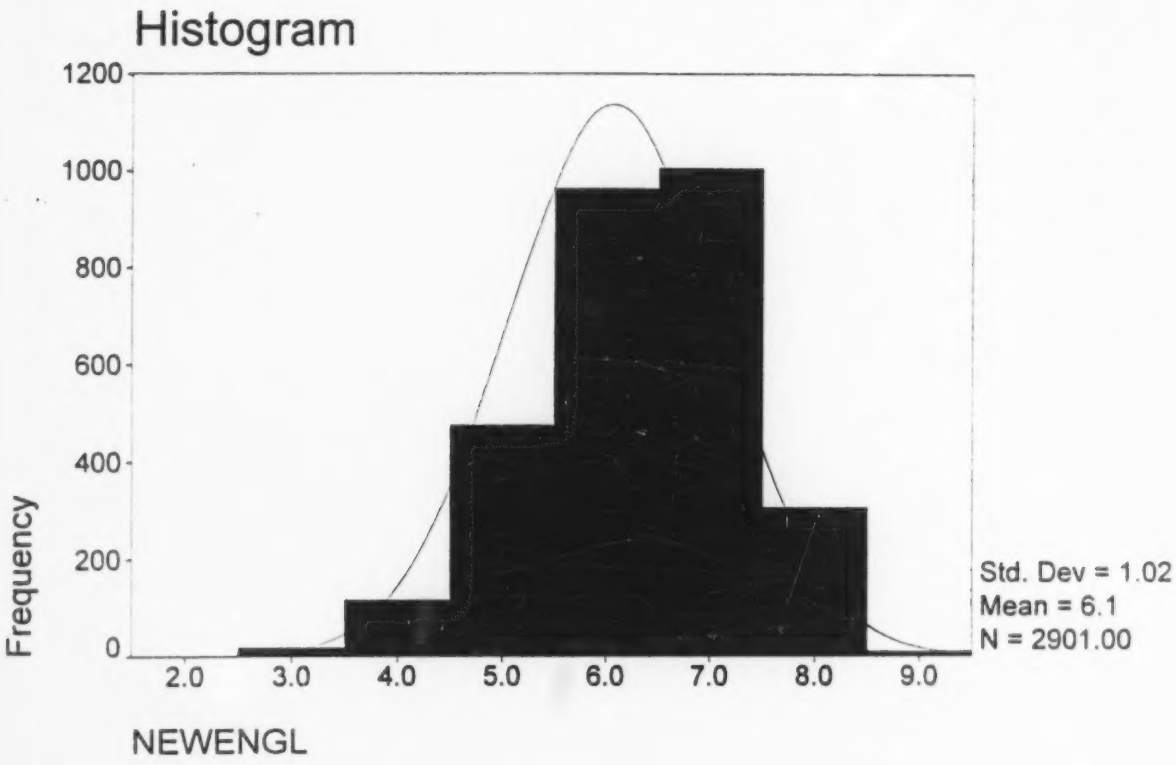
NEWENGL

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
	2.00	1	.0	.0	.0
	2.50	5	.2	.2	.2
	3.00	14	.5	.5	.7
	3.50	35	1.2	1.2	1.9
	4.00	82	2.8	2.8	4.7
	4.50	167	5.8	5.8	10.5
	5.00	309	10.7	10.7	21.1
	5.50	388	13.4	13.4	34.5
	6.00	577	19.9	19.9	54.4
	6.50	508	17.5	17.5	71.9
	7.00	499	17.2	17.2	89.1
	7.50	255	8.8	8.8	97.9
	8.00	51	1.8	1.8	99.7
	8.50	9	.3	.3	100.0
	9.00	1	.0	.0	100.0
	Total	2901	100.0	100.0	

Hi-Res Chart # 6:Histogram of newengl

Mean	6.067	Std err	.019	Median	6.000
Mode	6.000	Std dev	1.015	Variance	1.030
Maximum	9.000				

Valid cases 2901 Missing cases 0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600
400
200
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Frequency
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4.0
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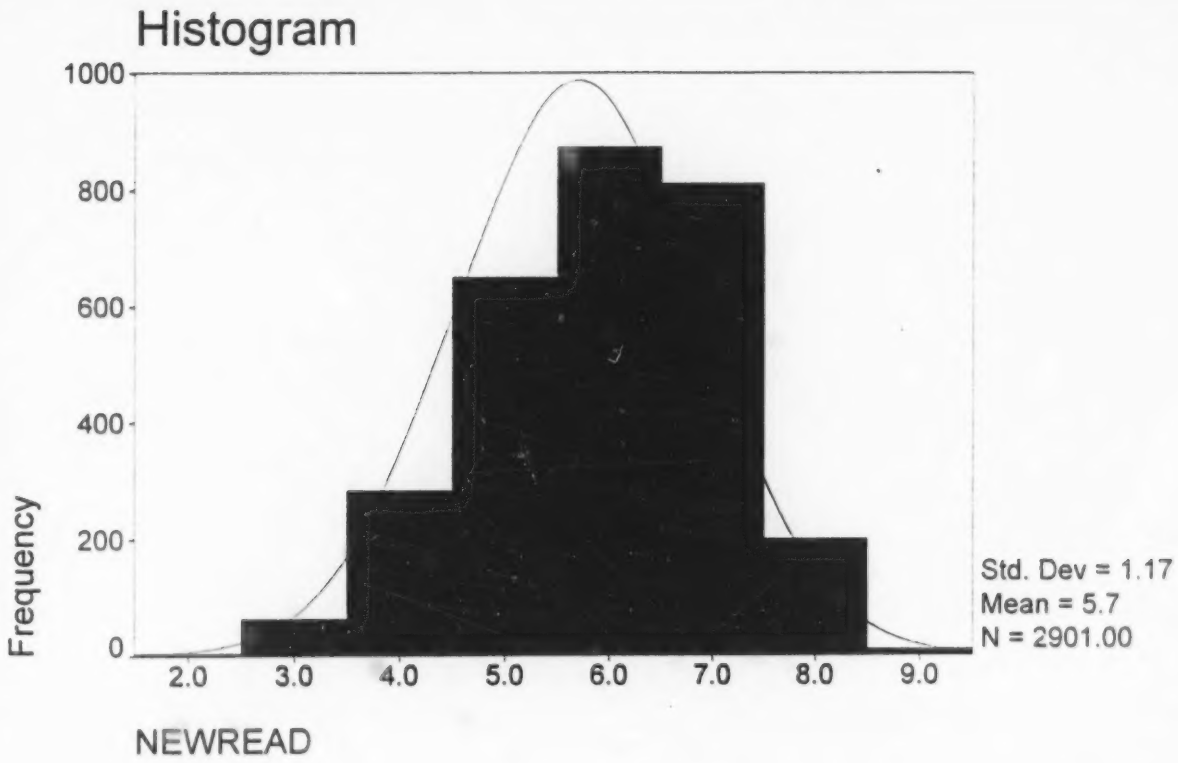
8.0
9.0
NEWENGL
Std. Dev = 1.02
Mean = 6.1
N = 2901.00


Histogram
1000
800
600
400
200
0
Frequency
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
NEWREAD
Std. Dev = 1.17
Mean = 5.7
N = 2901.00

NEWREAD

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
	1.50	2	.1	.1	.1
	2.00	2	.1	.1	.1
	2.50	17	.6	.6	.7
	3.00	47	1.6	1.6	2.3
	3.50	89	3.1	3.1	5.4
	4.00	195	6.7	6.7	12.1
	4.50	268	9.2	9.2	21.4
	5.00	383	13.2	13.2	34.6
	5.50	386	13.3	13.3	47.9
	6.00	489	16.9	16.9	64.7
	6.50	456	15.7	15.7	80.5
	7.00	356	12.3	12.3	92.7
	7.50	140	4.8	4.8	97.6
	8.00	60	2.1	2.1	99.6
	8.50	9	.3	.3	99.9
	9.00	2	.1	.1	100.0
	Total	2901	100.0	100.0	

Hi-Res Chart # 5:Histogram of newread

Mean	5.702	Std err	.022	Median	6.000
Mode	6.000	Std dev	1.169	Variance	1.367
Maximum	9.000				

Valid cases 2901 Missing cases 0

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18.00	4.00	25.00	5.00	3.00	1.50	5.50	6.50
7.00	2.00	15.00	3.00	3.00	1.50	3.50	4.50
21.00	5.00	15.00	3.00	3.00	1.50	6.50	4.50
8.00	2.00	16.00	3.00	3.00	1.50	3.50	4.50
19.00	4.00	16.00	3.00	3.00	1.50	5.50	4.50
7.00	2.00	11.00	2.00	4.00	2.00	4.00	4.00
12.00	3.00	9.00	2.00	5.00	2.50	5.50	4.50
12.00	3.00	21.00	4.00	6.00	3.00	6.00	7.00
18.00	4.00	23.00	4.00	5.00	2.50	6.50	6.50
18.00	4.00	15.00	3.00	3.00	1.50	5.50	4.50
18.00	4.00	24.00	5.00	2.00	1.00	5.00	6.00
5.00	1.00	9.00	2.00	6.00	3.00	4.00	5.00
14.00	3.00	17.00	3.00	6.00	3.00	6.00	6.00
22.00	5.00	23.00	4.00	4.00	2.00	7.00	6.00
18.00	4.00	21.00	4.00	5.00	2.50	6.50	6.50
16.00	4.00	20.00	4.00	6.00	3.00	7.00	7.00
15.00	3.00	22.00	4.00	5.00	2.50	5.50	6.50
14.00	3.00	27.00	5.00	5.00	2.50	5.50	7.50
17.00	4.00	26.00	5.00	5.00	2.50	6.50	7.50
11.00	3.00	21.00	4.00	4.00	2.00	5.00	6.00
20.00	4.00	24.00	5.00	4.00	2.00	6.00	7.00
5.00	1.00	13.00	3.00	6.00	3.00	4.00	6.00
14.00	3.00	27.00	5.00	6.00	3.00	6.00	8.00
14.00	3.00	8.00	2.00	4.00	2.00	5.00	4.00
10.00	2.00	21.00	4.00	5.00	2.50	4.50	6.50
12.00	3.00	14.00	3.00	4.00	2.00	5.00	5.00
21.00	5.00	16.00	3.00	2.00	1.00	6.00	4.00
15.00	3.00	18.00	4.00	4.00	2.00	5.00	6.00
8.00	2.00	21.00	4.00	3.00	1.50	3.50	5.50
20.00	4.00	21.00	4.00	3.00	1.50	5.50	5.50
19.00	4.00	25.00	5.00	4.00	2.00	6.00	7.00
13.00	3.00	21.00	4.00	6.00	3.00	6.00	7.00
29.00	6.00	28.00	5.00	3.00	1.50	7.50	6.50
14.00	3.00	22.00	4.00	5.00	2.50	5.50	6.50
16.00	4.00	17.00	3.00	6.00	3.00	7.00	6.00
16.00	4.00	14.00	3.00	4.00	2.00	6.00	5.00
10.00	2.00	18.00	4.00	6.00	3.00	5.00	7.00
15.00	3.00	14.00	3.00	4.00	2.00	5.00	5.00
12.00	3.00	17.00	3.00	4.00	2.00	5.00	5.00
8.00	2.00	15.00	3.00	4.00	2.00	4.00	5.00
7.00	2.00	7.00	2.00	6.00	3.00	5.00	5.00
14.00	3.00	26.00	5.00	4.00	2.00	5.00	7.00
11.00	3.00	19.00	4.00	5.00	2.50	5.50	6.50
21.00	5.00	32.00	6.00	3.00	1.50	6.50	7.50
22.00	5.00	17.00	3.00	4.00	2.00	7.00	5.00
24.00	5.00	29.00	5.00	4.00	2.00	7.00	7.00
10.00	2.00	13.00	3.00	5.00	2.50	4.50	5.50

READING	RECRED1	WRITING	RECENG1	HSGPA	NEWHSGPA	NEWREAD	NEWENGL
11.00	3.00	25.00	5.00	5.00	2.50	5.50	7.50
12.00	3.00	23.00	4.00	5.00	2.50	5.50	6.50
24.00	5.00	20.00	4.00	3.00	1.50	6.50	5.50
13.00	3.00	15.00	3.00	5.00	2.50	5.50	5.50
11.00	3.00	23.00	4.00	5.00	2.50	5.50	6.50
19.00	4.00	22.00	4.00	4.00	2.00	6.00	6.00
6.00	2.00	23.00	4.00	5.00	2.50	4.50	6.50
15.00	3.00	36.00	7.00	3.00	1.50	4.50	8.50
17.00	4.00	21.00	4.00	4.00	2.00	6.00	6.00
20.00	4.00	28.00	5.00	3.00	1.50	5.50	6.50
24.00	5.00	33.00	6.00	3.00	1.50	6.50	7.50
21.00	5.00	15.00	3.00	5.00	2.50	7.50	5.50
10.00	2.00	19.00	4.00	4.00	2.00	4.00	6.00
15.00	3.00	26.00	5.00	5.00	2.50	5.50	7.50
22.00	5.00	20.00	4.00	4.00	2.00	7.00	6.00
14.00	3.00	19.00	4.00	4.00	2.00	5.00	6.00
11.00	3.00	17.00	3.00	3.00	1.50	4.50	4.50
9.00	2.00	10.00	2.00	6.00	3.00	5.00	5.00
24.00	5.00	15.00	3.00	4.00	2.00	7.00	5.00
30.00	6.00	23.00	4.00	4.00	2.00	8.00	6.00
24.00	5.00	22.00	4.00	4.00	2.00	7.00	6.00
25.00	5.00	21.00	4.00	4.00	2.00	7.00	6.00
17.00	4.00	14.00	3.00	4.00	2.00	6.00	5.00
7.00	2.00	15.00	3.00	5.00	2.50	4.50	5.50
14.00	3.00	18.00	4.00	2.00	1.00	4.00	5.00
16.00	4.00	20.00	4.00	3.00	1.50	5.50	5.50
15.00	3.00	19.00	4.00	4.00	2.00	5.00	6.00
11.00	3.00	24.00	5.00	3.00	1.50	4.50	6.50
15.00	3.00	15.00	3.00	2.00	1.00	4.00	4.00
14.00	3.00	24.00	5.00	5.00	2.50	5.50	7.50
13.00	3.00	10.00	2.00	5.00	2.50	5.50	4.50
11.00	3.00	17.00	3.00	4.00	2.00	5.00	5.00
22.00	5.00	21.00	4.00	4.00	2.00	7.00	6.00
15.00	3.00	12.00	3.00	4.00	2.00	5.00	5.00
23.00	5.00	22.00	4.00	4.00	2.00	7.00	6.00
25.00	5.00	24.00	5.00	4.00	2.00	7.00	7.00
4.00	1.00	13.00	3.00	6.00	3.00	4.00	6.00
13.00	3.00	18.00	4.00	6.00	3.00	6.00	7.00
24.00	5.00	27.00	5.00	4.00	2.00	7.00	7.00
19.00	4.00	31.00	6.00	3.00	1.50	5.50	7.50
20.00	4.00	19.00	4.00	4.00	2.00	6.00	6.00
14.00	3.00	19.00	4.00	5.00	2.50	5.50	6.50
20.00	4.00	28.00	5.00	1.00	.50	4.50	5.50
19.00	4.00	24.00	5.00	5.00	2.50	6.50	7.50
28.00	6.00	24.00	5.00	3.00	1.50	7.50	6.50
24.00	5.00	31.00	6.00	3.00	1.50	6.50	7.50
13.00	3.00	28.00	5.00	3.00	1.50	4.50	6.50
23.00	5.00	27.00	5.00	4.00	2.00	7.00	7.00
16.00	4.00	24.00	5.00	4.00	2.00	6.00	7.00
13.00	3.00	14.00	3.00	3.00	1.50	4.50	4.50

READING	RECRED1	WRITING	RECENG1	HSGPA	NEWHSGPA	NEWREAD	NEWENGL
14.00	3.00	20.00	4.00	5.00	2.50	5.50	6.50
26.00	6.00	20.00	4.00	4.00	2.00	8.00	6.00
20.00	4.00	24.00	5.00	3.00	1.50	5.50	6.50
12.00	3.00	24.00	5.00	3.00	1.50	4.50	6.50
17.00	4.00	26.00	5.00	5.00	2.50	6.50	7.50
24.00	5.00	19.00	4.00	4.00	2.00	7.00	6.00
22.00	5.00	15.00	3.00	4.00	2.00	7.00	5.00
7.00	2.00	13.00	3.00	5.00	2.50	4.50	5.50
20.00	4.00	22.00	4.00	3.00	1.50	5.50	5.50
20.00	4.00	19.00	4.00	4.00	2.00	6.00	6.00
16.00	4.00	24.00	5.00	4.00	2.00	6.00	7.00
21.00	5.00	19.00	4.00	4.00	2.00	7.00	6.00
14.00	3.00	15.00	3.00	5.00	2.50	5.50	5.50
20.00	4.00	16.00	3.00	5.00	2.50	6.50	5.50
20.00	4.00	21.00	4.00	5.00	2.50	6.50	6.50
10.00	2.00	22.00	4.00	5.00	2.50	4.50	6.50
21.00	5.00	22.00	4.00	3.00	1.50	6.50	5.50
18.00	4.00	27.00	5.00	5.00	2.50	6.50	7.50
12.00	3.00	24.00	5.00	4.00	2.00	5.00	7.00
10.00	2.00	12.00	3.00	5.00	2.50	4.50	5.50
9.00	2.00	14.00	3.00	6.00	3.00	5.00	6.00
20.00	4.00	27.00	5.00	5.00	2.50	6.50	7.50
15.00	3.00	28.00	5.00	5.00	2.50	5.50	7.50
12.00	3.00	16.00	3.00	4.00	2.00	5.00	5.00
25.00	5.00	24.00	5.00	3.00	1.50	6.50	6.50
15.00	3.00	19.00	4.00	5.00	2.50	5.50	6.50
17.00	4.00	22.00	4.00	5.00	2.50	6.50	6.50
16.00	4.00	24.00	5.00	5.00	2.50	6.50	7.50
11.00	3.00	21.00	4.00	4.00	2.00	5.00	6.00
17.00	4.00	23.00	4.00	5.00	2.50	6.50	6.50
23.00	5.00	27.00	5.00	4.00	2.00	7.00	7.00
20.00	4.00	29.00	5.00	5.00	2.50	6.50	7.50
23.00	5.00	21.00	4.00	4.00	2.00	7.00	6.00
20.00	4.00	18.00	4.00	6.00	3.00	7.00	7.00
11.00	3.00	14.00	3.00	3.00	1.50	4.50	4.50
15.00	3.00	23.00	4.00	1.00	.50	3.50	4.50
25.00	5.00	24.00	5.00	3.00	1.50	6.50	6.50
20.00	4.00	25.00	5.00	5.00	2.50	6.50	7.50
12.00	3.00	27.00	5.00	5.00	2.50	5.50	7.50
17.00	4.00	14.00	3.00	5.00	2.50	6.50	5.50
6.00	2.00	14.00	3.00	5.00	2.50	4.50	5.50
24.00	5.00	23.00	4.00	2.00	1.00	6.00	5.00
6.00	2.00	12.00	3.00	6.00	3.00	5.00	6.00
18.00	4.00	16.00	3.00	6.00	3.00	7.00	6.00
18.00	4.00	29.00	5.00	5.00	2.50	6.50	7.50
18.00	4.00	22.00	4.00	4.00	2.00	6.00	6.00
19.00	4.00	18.00	4.00	3.00	1.50	5.50	5.50
16.00	4.00	24.00	5.00	1.00	.50	4.50	5.50
10.00	2.00	20.00	4.00	4.00	2.00	4.00	6.00
23.00	5.00	29.00	5.00	3.00	1.50	6.50	6.50

READING	RECRED1	WRITING	RECENG1	HSGPA	NEWHSGPA	NEWREAD	NEWENGL
14.00	3.00	15.00	3.00	7.00	3.50	6.50	6.50
22.00	5.00	21.00	4.00	5.00	2.50	7.50	6.50
14.00	3.00	22.00	4.00	3.00	1.50	4.50	5.50
14.00	3.00	23.00	4.00	2.00	1.00	4.00	5.00
15.00	3.00	16.00	3.00	2.00	1.00	4.00	4.00
17.00	4.00	28.00	5.00	4.00	2.00	6.00	7.00
24.00	5.00	27.00	5.00	2.00	1.00	6.00	6.00
14.00	3.00	26.00	5.00	4.00	2.00	5.00	7.00
15.00	3.00	19.00	4.00	6.00	3.00	6.00	7.00
12.00	3.00	23.00	4.00	5.00	2.50	5.50	6.50
18.00	4.00	24.00	5.00	3.00	1.50	5.50	6.50
30.00	6.00	22.00	4.00	4.00	2.00	8.00	6.00
28.00	6.00	21.00	4.00	4.00	2.00	8.00	6.00
24.00	5.00	31.00	6.00	3.00	1.50	6.50	7.50
11.00	3.00	14.00	3.00	4.00	2.00	5.00	5.00
11.00	3.00	17.00	3.00	6.00	3.00	6.00	6.00
19.00	4.00	20.00	4.00	5.00	2.50	6.50	6.50
16.00	4.00	26.00	5.00	5.00	2.50	6.50	7.50
13.00	3.00	21.00	4.00	4.00	2.00	5.00	6.00
7.00	2.00	23.00	4.00	4.00	2.00	4.00	6.00
19.00	4.00	25.00	5.00	1.00	.50	4.50	5.50
7.00	2.00	9.00	2.00	7.00	3.50	5.50	5.50
24.00	5.00	29.00	5.00	4.00	2.00	7.00	7.00
31.00	7.00	18.00	4.00	3.00	1.50	8.50	5.50
21.00	5.00	17.00	3.00	4.00	2.00	7.00	5.00
4.00	1.00	21.00	4.00	6.00	3.00	4.00	7.00
12.00	3.00	10.00	2.00	5.00	2.50	5.50	4.50
19.00	4.00	19.00	4.00	5.00	2.50	6.50	6.50
30.00	6.00	28.00	5.00	3.00	1.50	7.50	6.50
9.00	2.00	9.00	2.00	3.00	1.50	3.50	3.50
8.00	2.00	9.00	2.00	4.00	2.00	4.00	4.00
17.00	4.00	21.00	4.00	5.00	2.50	6.50	6.50
20.00	4.00	25.00	5.00	5.00	2.50	6.50	7.50
25.00	5.00	24.00	5.00	4.00	2.00	7.00	7.00
12.00	3.00	15.00	3.00	4.00	2.00	5.00	5.00
14.00	3.00	21.00	4.00	5.00	2.50	5.50	6.50
12.00	3.00	21.00	4.00	6.00	3.00	6.00	7.00
26.00	6.00	26.00	5.00	3.00	1.50	7.50	6.50
23.00	5.00	21.00	4.00	5.00	2.50	7.50	6.50
23.00	5.00	16.00	3.00	6.00	3.00	8.00	6.00
22.00	5.00	27.00	5.00	3.00	1.50	6.50	6.50
7.00	2.00	19.00	4.00	4.00	2.00	4.00	6.00
6.00	2.00	9.00	2.00	7.00	3.50	5.50	5.50
16.00	4.00	19.00	4.00	4.00	2.00	6.00	6.00
25.00	5.00	30.00	6.00	2.00	1.00	6.00	7.00
10.00	2.00	21.00	4.00	4.00	2.00	4.00	6.00
16.00	4.00	25.00	5.00	4.00	2.00	6.00	7.00
9.00	2.00	21.00	4.00	4.00	2.00	4.00	6.00
19.00	4.00	24.00	5.00	5.00	2.50	6.50	7.50
12.00	3.00	17.00	3.00	4.00	2.00	5.00	5.00

READING	RECRED1	WRITING	RECENG1	HSGPA	NEWHSGPA	NEWREAD	NEWENGL
25.00	5.00	28.00	5.00	4.00	2.00	7.00	7.00
18.00	4.00	19.00	4.00	6.00	3.00	7.00	7.00
25.00	5.00	25.00	5.00	3.00	1.50	6.50	6.50
28.00	6.00	21.00	4.00	4.00	2.00	8.00	6.00
6.00	2.00	9.00	2.00	3.00	1.50	3.50	3.50
10.00	2.00	15.00	3.00	4.00	2.00	4.00	5.00
7.00	2.00	18.00	4.00	4.00	2.00	4.00	6.00
10.00	2.00	21.00	4.00	5.00	2.50	4.50	6.50
16.00	4.00	17.00	3.00	4.00	2.00	6.00	5.00
9.00	2.00	22.00	4.00	6.00	3.00	5.00	7.00
19.00	4.00	31.00	6.00	3.00	1.50	5.50	7.50
14.00	3.00	25.00	5.00	5.00	2.50	5.50	7.50
18.00	4.00	27.00	5.00	4.00	2.00	6.00	7.00
12.00	3.00	17.00	3.00	4.00	2.00	5.00	5.00
6.00	2.00	6.00	2.00	2.00	1.00	3.00	3.00
20.00	4.00	26.00	5.00	5.00	2.50	6.50	7.50
15.00	3.00	22.00	4.00	5.00	2.50	5.50	6.50
8.00	2.00	10.00	2.00	5.00	2.50	4.50	4.50
24.00	5.00	19.00	4.00	4.00	2.00	7.00	6.00
12.00	3.00	20.00	4.00	2.00	1.00	4.00	5.00
29.00	6.00	20.00	4.00	3.00	1.50	7.50	5.50
20.00	4.00	23.00	4.00	5.00	2.50	6.50	6.50
24.00	5.00	22.00	4.00	4.00	2.00	7.00	6.00
19.00	4.00	23.00	4.00	4.00	2.00	6.00	6.00
19.00	4.00	22.00	4.00	3.00	1.50	5.50	5.50
19.00	4.00	22.00	4.00	5.00	2.50	6.50	6.50
9.00	2.00	22.00	4.00	5.00	2.50	4.50	6.50
18.00	4.00	18.00	4.00	6.00	3.00	7.00	7.00
25.00	5.00	22.00	4.00	5.00	2.50	7.50	6.50
14.00	3.00	17.00	3.00	5.00	2.50	5.50	5.50
12.00	3.00	25.00	5.00	5.00	2.50	5.50	7.50
4.00	1.00	12.00	3.00	5.00	2.50	3.50	5.50
18.00	4.00	23.00	4.00	6.00	3.00	7.00	7.00
20.00	4.00	26.00	5.00	3.00	1.50	5.50	6.50
8.00	2.00	28.00	5.00	7.00	3.50	5.50	8.50
9.00	2.00	11.00	2.00	6.00	3.00	5.00	5.00
9.00	2.00	20.00	4.00	5.00	2.50	4.50	6.50
10.00	2.00	17.00	3.00	5.00	2.50	4.50	5.50
15.00	3.00	21.00	4.00	6.00	3.00	6.00	7.00
9.00	2.00	16.00	3.00	5.00	2.50	4.50	5.50
25.00	5.00	23.00	4.00	3.00	1.50	6.50	5.50
15.00	3.00	14.00	3.00	4.00	2.00	5.00	5.00
2.00	1.00	8.00	2.00	7.00	3.50	4.50	5.50
16.00	4.00	17.00	3.00	3.00	1.50	5.50	4.50
7.00	2.00	18.00	4.00	6.00	3.00	5.00	7.00
13.00	3.00	19.00	4.00	6.00	3.00	6.00	7.00
25.00	5.00	22.00	4.00	5.00	2.50	7.50	6.50
10.00	2.00	14.00	3.00	4.00	2.00	4.00	5.00
19.00	4.00	23.00	4.00	3.00	1.50	5.50	5.50
16.00	4.00	34.00	6.00	1.00	.50	4.50	6.50